Attention Deficit/Hyperactivity Disorder and Creativity: An investigation into their relationship.

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ABSTRACT

A series of questions regarding the relationship between Attention Deficit / Hyperactivity Disorder (ADHD) and creativity were addressed in this dissertation. Firstly, the creative abilities of 34 ADHD and 33 control children were compared in order to establish whether children with ADHD are more creative than controls. Results indicated that children with ADHD are equally as creative as controls. Secondly, the presence of ADHD symptomatology among 30 creative children was investigated and it was found that 40% of them displayed clinically elevated symptoms of ADHD, but none of them met full criteria for the disorder. Thirdly, the cognitive functioning four groups of children was compared: 29 ADHD who were not creative, 12 creative who displayed symptoms of ADHD, but did not meet full criteria (CA), 18 creative with no symptoms of ADHD (CNA), and 30 controls (NC). As it is well established that children with ADHD have deficits in their executive functioning, this study aimed to investigate whether the CA group displayed similar deficits. Results showed that the ADHD children had the most difficulty with the tasks, the CA children fell between the ADHD and CNA groups, and there was no difference between the CNA and NC groups. Finally, the psychosocial functioning of four groups of children was compared: 29 ADHD who were not creative, 16 creative with clinically elevated symptoms of ADHD (CA), 18 creative with no symptoms of ADHD (CNA), and 30 controls (NC). Results mirrored the continuum effect found on the cognitive functioning measures where the ADHD children had the most difficulties, the CA children fell between the ADHD and CNA groups, and there was no difference between the CNA and NC groups. The findings are discussed in light of existing research findings and theory in both ADHD and creativity, and in terms of the risks of misdiagnosing highly creative children as ADHD.

CHAPTER 1

GENERAL INTRODUCTION

Both creativity and Attention Deficit Hyperactivity Disorder (ADHD) are hotly debated topics in the child psychology literature. There is much dispute over what exactly both ADHD and creativity are and recently also about the overlap between these two phenomena (Shaw & Brown, 1991; Cramond, 1994; Lovecky, 1994; Leroux & Levitt-Perlman, 2000). The literature on these topics suggests that there is a subgroup of highly creative children that display the same behavioural difficulties as ADHD children, where both groups of children are seen to be inattentive, hyperactive and impulsive (Cramond, 1994; Dawson, 1997; Guenther, 1995). There are only a few studies in this area, all of which have focused on the similarities between these two groups and have expressed concerns about the misdiagnosis of highly creative children as having ADHD. This dissertation aims to add to the literature on the similarities but also hopes to determine whether any factors may successfully differentiate the two.

1.1 A brief description of ADHD

Attention-Deficit/Hyperactivity Disorder (ADHD) is the existing label for one of the most prevalent and vigorously studied conditions in child psychology. Its core symptoms include extreme inattention and hyperactive/impulsive behaviour. It is conservatively estimated to occur in 3-6% of children from varied cultures and geographical regions, with an overrepresentation of boys by approximately 3:1. (American Psychiatric Association, 2000). ADHD affects individuals throughout the lifespan, although there are age and gender related changes in its manifestation (Weiss & Hechtman, 1993; Barkley, 1998; Tannock, 1998).

The etiology of ADHD

ADHD appears to be far more influenced by neurological or genetic factors then by social or environmental ones (Barkley, 1998). A variety of genetic and neurological etiologies such as pregnancy and birth complications (Barkley, DuPaul, & McMurray, 1990), acquired brain damage (Max et. al, 1998), toxins (Needleman, Schell, Bellinger, Leviton, & Alfred, 1990), and genetic effects (Stevenson, 1994; van den Oord, Boomsma, & Verhulst, 1994) can give rise to the disorder through some disturbance in the prefrontal cortical-striatal network (Barkley, 1998). The prefrontal cortex is believed to receive information from all of the sensory systems, including sensation from the interior of the body (Kalat, 1995). Initial studies of genes associated with the disorder suggest that mutations of genes within the dopamine system that richly innervates frontal-striatal circuits may increase the susceptibility for ADHD (Tannock, 1998). Also structurally, decreases in the size of the corpus callosum (which transfers information from one hemisphere to the other) have been observed in 5 of 6 studies of ADHD (Hynd, Semrud-Clikeman, Lorys, Novey, Eliopulos, & Lyytinen, 1991).

As well as structural differences in their brains, it has been suggested that children with ADHD have lower levels of dopamine and noradrenalin in their brain than do their non-ADHD peers. For example, studies of cerebral spinal fluid in ADHD and normal children have indicated decreased brain dopamine in ADHD children (Raskin, Shaywitz, Shaywitz, Anderson, & Cohen, 1984). Other studies have implicated genes that encode dopamine receptors and transporters with ADHD (Kirley, et. al., 2002; Madras, Miller, & Fischman, 2002). These genes are very active in the prefrontal cortex and basal ganglia. Furthermore, studies of blood and urinary metabolites of brain neurotransmitters showed significantly lower levels of the noradrenergic metabolite in children with ADHD

(Halperin, Newcorn, Koda, Pick, McKay, & Knott, 1997). Dopamine is a neurotransmitter that carries messages across synapses in the brain and is critical to the brain's braking or inhibiting system and noradrenalin is crucial to the maintenance of alertness, drive and motivation (Carlson, 1994),.

Pharmacological treatment using stimulant medication, such as methylphenidate or amphetamine (e.g., Ritalin) is the most common for this disorder. This medication works mainly at the dopamine synapse where it stimulates the release and/or blocks the re-uptake of dopamine. This increases the extra cellular dopamine in the synaptic space improving their inhibiting or braking system (Swanson, et. al., 2000).

Although the American Psychiatric Association (2000) describes the core behavioural symptoms of ADHD as inattention, impulsivity and hyperactivity; attention does not seem to be the most fundamental deficit for children with ADHD. Attention is close to normal in these children when doing highly rewarding or punishing activities, very stimulating activities (e.g., watching T.V. or playing computer games), and novel activities (Barkley, 1998). Furthermore, children with ADHD appear to have an unusually strong desire for immediate reward (Douglas & Parry, 1994; Tripp & Alsop, 2001; Tripp & Alsop, 1999) and thus their attention can be held by such tasks as computer games where frequent rewards are available. Instead, a deficit in behavioural inhibition (impulsiveness) is the most distinguishing characteristic. This involves a failure to inhibit or delay a behavioural response (Barkley, 1998; Tannock, 1998). The implications of this deficit are that poor behavioural inhibition is associated with a significant disruption in the development of normal self-regulation and so these children are struggling to control (regulate) their responses and behaviours (Barkley, 1998). Also, due to an under active behavioural

inhibition system, children with ADHD are less likely to inhibit responses when they are associated with punishment and non-reward, and therefore their behaviour is very difficult to manipulate or control (Barkley, 1998).

The developmental course of ADHD

On average, children with ADHD are behind in age-appropriate abilities of self-control, by about 30% (Barkley, 1998). These children's difficulties in self-regulation represent a delay in development rather than a halt (Du Paul, Power, Anastopoulos, & Reid, 1998). This means that with age, children diagnosed with ADHD will always be improving, but they will generally be behind their same aged non-ADHD peers. They do not, age appropriately, gain the progressively internalised capabilities of self-control. The developmental delay in children with ADHD is fundamentally a delay in their ability to self-regulate their behaviour (Levy & Hay, 2001). This consists of a problem of "behavioural inhibition" interacting with "executive functions" (Durall, 1999). Although there are many varied definitions of executive functions, there is strong agreement in the literature that executive functions do not refer to basic cognitive processes such as sensation, perception, motor activation, attention, or memory. Instead the term is typically used to refer to psychological processes involved in one or more of the following capacities: self-regulation, sequencing of behaviour, flexibility of thinking or responding, response inhibition, planning, and organisation of behaviour (Tannock, 1998). Therefore, these functions can be seen as operations within the brain that promote and allow for self-regulation or self-control. An example of how a lack of self-regulation/control can impact on the lives of children with ADHD is that if a task such as homework lacks immediate, external incentives, then there will be a resultant lack of arousal, motivation, and persistence. The child with ADHD fails to perform because the internal mechanisms to self-

create the arousal, motivation, and persistence are lagging developmentally (Levy & Hay, 2001).

As well as delays in self control, numerous studies have indicated that children with ADHD also have a delay in their development of motor inhibition/motor control, and display significantly poorer motor and developmental coordination abilities than their peers (Barkley et. al., 1990; Carte, Nigg, & Hinshaw, 1996; Denckla, Rudel, Champan, & Krieger, 1985; Kadesjo & Gillberg, 2001).

Five sites in America have been conducting major longitudinal studies of ADHD. These include the Montreal study run by Weiss, Hechtman and colleagues, the Los Angeles study run by Satterfield, Hoppe, Schell and colleagues, the Milwaukee study run by Barkley, Fischer and colleagues, the Iowa study run by Loney, Kramer, Milich and colleagues, and the New York study run by Mannuzza, Gittelman and colleagues. These longitudinal studies have shown that the hyperactive-impulsive symptoms of the disorder seem to appear first and are often apparent at ages three to five. The combined type of ADHD generally has it's onset around ages five to eight when inattentive symptoms become apparent; and the predominantly inattentive subtype usually has it's onset a few years later at around age eight to twelve (Applegate et.al., 1997). Fifty to 80% of children diagnosed with ADHD are likely to continue to meet criteria during adolescence (Claude & Firestone, 1995; Mannuzza, Klein, Bessker, Malloy, & LaPadula, 1993), and 31 to 60% of adults continued to be disabled by at least one core symptom of ADHD (Rasmussen & Gillberg, 2001; Mannuzza, Klein, Bonagura, Malloy, Giampino, & Addalli, 1991; Weiss & Hechtman, 1993). Overall, the persistence of ADHD across the lifespan has been associated with initial severity of hyperactive/impulsive behaviour, co-existence of conduct and

oppositional defiant disorders, conflict in parent-child interactions, and maternal depression (Fischer, Barkley, Fletcher & Smallish, 1993).

Theoretical models of ADHD

Numerous models, explanations, and theories of ADHD have been postulated and descriptions of all of these are outside of the scope of this dissertation. The following is a description of some of the main theoretical stances taken in trying to conceptualize the underlying mechanisms or causes of this disorder.

One of the most prominent models of ADHD was developed by Barkley (1997). His model describes the role and impact that executive functioning deficits have on the development of ADHD, and places behavioural inhibition (defined as the ability to inhibit responses and delay reactions to events) at a central point in its relation to four executive functions dependent upon it for their own execution. These four executive functions permit human self-regulation, bringing behaviour progressively more under control of time and the influence of future over immediate consequences. The end result is a greater capacity for predicting and controlling one's environment (and one's behaviour within it) so as to maximize future consequences to the individual. More generally, the interaction of these executive functions permits far more effective adaptive functioning. The four executive functions include: 1) Working memory which is the ability to hold information on line and adapt/use it (i.e. information on how to respond to an event can be recalled from long term memory and used to create a preparation to act), 2) Self regulation of affect which is the ability to inhibit behavioural responses to emotional experiences, 3) Internalization of speech where the privatization of speech leads to increased control over one's behaviour, planning and goal direction, 4) Reconstitution which allows events to be mentally

disassembled so as to extract more information about an event before preparing a response. According to the model, these four executive functions are dependent on behavioural inhibition for their own execution.

The model further stipulates that deficits in each of these executive functions have an impact on the individuals functioning. Deficits in working memory decrease an individual's ability to reply on forethought and hindsight in governing behaviour, and decrease their estimation of time. Deficits in self regulation lead to increased emotional expression, decreased objectivity in selecting a response to an event, an inability to delay emotional responses in order to take others into account, decreased ability to induce drive and motivational states associated with goal directed behaviour. Deficits in internalized speech lead to excessive talking, a lack of reflection before acting, difficulties with organized and rule governed self-speech, decreased self control and rule governed behaviour. Finally, deficits in reconstitution lead to impairments in analysis and synthesis in the formation of responses to events (Barkley, 1997).

Further, the model suggests that these four executive functions are needed for the development of complex fine and gross motor skills. These skills are needed to ensure that only those reactions required to accomplish a task are initiated by the individual (Barkley, 1997).

Another influential model of ADHD suggests that the disorder stems from suboptimal reward processes where future rewards have a reduced ability to control behaviour in children with ADHD compared to controls (Sagvolden, Aase, Zeiner & Berger, 1998). This model has been supported by the extensive research findings that children with ADHD are hypersensitive to delay, have difficulties awaiting reward, and struggle to work consistently and effectively over extended period of time (e.g., Kuntsi,

Oosterlaan, & Stevenson, 2001; Sonuga-Barke, Williams, Hall, & Saxton, 1996; Tripp & Alsop, 2001). Sonuga-Burke, Houlberg, and Hall (1994) proposed the "delay aversion hypothesis" for ADHD. They suggested that due to their inability to await future reward they develop a delay aversion which is a negative emotional reaction that follows the imposition of a delay. This negative emotional reaction is then expressed behaviourally via attempts to avoid or escape delay (which compounds their tendency to act impulsively); or if they cannot avoid it they will attend to, or act on, other aspects of their environment that are interesting to them (often seen as inattention and over activity in the child).

A further model that has influenced the conceptualization of ADHD is Quay's (1988) model of childhood mental disorders. This model is based on Gray's (1982) theory that there are two systems in the brain that regulate an individual's sensitivity and response to reward and punishment. These are the Behavioural Inhibition System (BIS), which processes indictors of punishment and the Behavioural Activation System (BAS), which processes indicators of reward. Quay argues that children with ADHD have an under active BIS which results in a lack of inhibition in the presence of stimuli related to punishment (e.g., parental commands), which in turn results in them being less responsive to punishment.

Earlier models of ADHD suggested that environmental factors such as parenting style could cause ADHD. For example, Willis and Lovaas suggested that hyperactivity in children occurred as a result of poor stimulus control which arose from deficient parental management of children. Purely social theories of ADHD have not received much support in the literature (see Johnston & Mash, 2001). What the literature has shown however, is that the severity and continuity of symptoms and types of comorbid disorders that may

develop in children with ADHD are likely to be associated with parental and larger environmental factors (Johnston & Mash, 2001).

Cognitive functioning in ADHD

Numerous studies have been conducted to examine the executive functioning deficits in children with ADHD. In support of Barkley's model, a growing number of studies have shown that an inability to inhibit or delay responses (as measured by either the Stop or Stroop Tasks) is a fundamental deficit for children with ADHD as they take significantly longer to inhibit responses than do controls (Bedard, Ickowicz, Logan, Hogg-Johnson, Schachar, & Tannock, 2003; Lufi, Cohen, & Parish-Plass, 1990; Nigg, 1999; Oosterlaan, Logan & Sergeant, 1998; Pliszka, Borcherding, Spatley, Keon, & Irick, 1997; Rucklidge & Tannock, 2002; Schachar, Mota, Logan, Tannock, & Klim, 2000; Seidman, Biederman, Faraone, Weber, & Ouellette, 1997). Yet, on the other hand, there are some studies that have found no differences between ADHD and controls on Stroop interference (Nigg, Blaskey, Huang-Pollock & Rappley, 2002; Rucklidge & Tannock, 2002), only differences in the speed at which they processed the information in the task. These findings support those that have shown colour naming deficits, overall slow reaction times, and processing speed deficits in ADHD children (e.g., Nigg, Hinshaw, Carte & Treuting, 1998; Tannock, Martinussen, & Frijters, 2000). Thus it could be suggested that ADHD children may not have deficits in inhibition per se, but rather in processing speed which could be expressed as an inhibitory deficit where ADHD children take longer (due to processing speed deficits) to inhibit responses than controls.

As well as overall inhibitory control deficits, ADHD children have also been found to have deficits in working memory (Berlin, Bohlin, Nyberg, & Janols, 2004; McInnes, Humphries, Hogg-Johnson, & Tannock, 2003; Tripp, Ryan, & Peace, 2002; Tannock, 1998), Self regulation of affect (Braaten & Rosén, 2000; Crundwell, 2002), internalization of speech (Berk & Potts,

1991; Foley Nicpon, 2003), and motor responses (Ben-Pazi, Gross-Tsur, Bergman, & Shalev, 2003; Frank, Seiden, & Napolitano, 1996; Perchet, Revol, Fourneret, Mauguière, & Garcia-Larrea, 2001; Tannock, 1998) which, according to Barkley's (1997) model, all rely on inhibitory control. However, results of Sarkari's (2003) study did not support the assertion that measures of reconstitution would differentiate groups of children with and without the disorder.

Due to the different diagnostic classifications of ADHD used in past versions of the DSM (Diagnostic and Statistical Manual of Mental Disorders), much of the research on ADHD and executive functioning has not distinguished between the three subtypes of the disorder now set out in the DSM-IV (American Psychological Association, 2000). Barkley's (1997) model only applies to the hyperactive subtype of ADHD suggesting that it is only this subtype that fundamentally experiences difficulties with behavioural inhibition and the four executive functions it underlies. A number of studies have begun to compare the executive functioning abilities of the three substypes of ADHD. Houghton, et al. (1999) compared inattentive and combined subtypes of ADHD on the Wisconsin Card Sort Test (WCST), Matching Familiar Faces, Trailmaking, Stroop Test (ST), and Tower of London (TOL) and found no differences between them. On the other hand, Klorman, et.al. (1999) tested all three subtypes on the WCST and TOL and found that on the TOL, the inattentive subtype performed better than the hyperactive and combined subtypes, but no group differences were apparent on the WCST. Similarly, Nigg, Blaskey, Huang-Pollock, and Rappley, 2002 compared children diagnosed with ADHD-combined type to those diagnosed with ADHD-predominantly inattentive on the Stop task, TOL, ST, and Trailmaking, and found that overall, the two subtypes did not differ significantly from one another. On the other hand, Schmitz et. al. (2002), compared the three subtypes on the WCST, ST, Digit Span and Word Span, and found that the hyperactive subtype performed better than the combined on WCST and Digit Span, and better than on ST than the

inattentive subtype. Therefore, due to the contradictory findings to date, it is unclear whether executive functioning deficits differ across the different subtypes of ADHD.

Social functioning in ADHD

As well as having these cognitive deficits, children with ADHD have also been shown to experience problems socially due to their inability to regulate their own behaviour. The presence of ADHD in a child appears to negatively affect the interactions between all members of the family (Woodward , Taylor, & Dowdney, 1998).

Research has found that children with ADHD are more defiant, talkative, demanding of assistance, and less compliant and able to play independently than controls. Their mothers were found to be less responsive to their children's questions, more controlling and directive, and less rewarding (Danforth, Barkley, & Stokes, 1991; Johnston & Mash, 2001). Children with ADHD have also been found to have more negative interactions with their siblings than do controls (Mash & Johnston, 1983; Taylor, Sandberg, Thorley, & Giles, 1991). Parents of children with ADHD report more parenting stress (Fisher, 1990), marital conflict, separation/divorce (Johnston & Mash, 2001), maternal depression (Johnston & Mash, 2001), alcohol consumption (Pelham & Lang, 1993); and less parenting competence (Johnston & Mash, 2001), and extended family involvement (Cunningham, Benness & Siegel, 1988) than parents of children without the disorder. Research into the direction of the effects of these family factors associated with ADHD has shown that they are from child to parent as opposed to parent to child; and that the child's impulsive, unruly, noncompliant and emotional behaviour appeared to affect parents' behaviour (Danforth, Barkley & Stokes, 1991; Johnston & Mash, 2001). Thus it can be argued that parenting behaviours are not the cause of impulsive, hyperactive, and

inattentive behaviours or their related deficits in executive functioning and self regulation (Barkley, 2003).

Furthermore, outside of the home children with ADHD have also been seen to have a significant impairment in relationships with their teachers (Whalen, Henker & Dotemoto, 1980) and peers (Du Paul, McGoey, Eckert & Van Brakle, 2001). Gaub and Carlson (1997) found that teachers rated children with all three subtypes of ADHD as being liked by fewer classmates, disliked and ignored by more classmates, and less happy, hardworking and appropriate than comparison children. Children with ADHD have also been found to have more school suspensions and expulsions (Barkley, Fischer, Edelbrock & Smallish, 1990).

Erhardt and Hinshaw (1994) found that children with ADHD had fewer friends, were less liked by others, and were overwhelmingly more rejected than their non-ADHD peers. Similarly, Lahey et. al. (1988) found that all subtypes of ADHD were rated by their teachers as being less popular with their classmates, less prosocial, less cooperative, and less assertive than controls. The children also rated themselves as having greater problems with friendships than the comparison children did. Numerous studies have shown that the social difficulties experienced by children with ADHD are related to their high levels of activity, talkativeness, impulsive actions, emotional expressiveness (especially anger), negative physical behaviours, and limited knowledge of social skills (Casey, 1996; Erhardt & Hinshaw, 1994; Madan-Swain & Zentall, 1990). These difficulties are likely to lead to an increased risk for social isolation (Tannock, 1998) which will compound their deficient social skills (Barkley, 1998; Tannock, 1998, Wolfle & French, 1990).

The extensive social difficulties experienced by children with ADHD may explain Bauermeister, Alegria, Bird, and Rubio-Stipec's (1992) finding that clinicians gave all three subtypes of ADHD children lower ratings of adaptive functioning.

Academic functioning in ADHD

Most children diagnosed with ADHD are reported to have difficulties with school performance. Research has consistently found that as a group these children score lower than controls on standardized achievement tests (Fisher, Barkley, Edelbrock, & Smallish, 1990; Hinshaw, 1994), and that these differences are already apparent at pre-school age suggesting that the disorder may affect knowledge acquisition and development of academic skills from a very early age (Barkley, et. a., 2002). Studies report that when conservatively defined, 19-26% of children with ADHD also have a comorbid learning disability (Barkley, 1998). However, Lambert & Sandoval (1980) who defined a learning disability (LD) as "a significant discrepancy between intelligence and achievement" found that 53% of children with ADHD had an LD. Further, when LD was described as functioning two grades below grade level, then about 80% of 11 year children with ADHD were identified as LDs (Cantwell & Baker, 1992). The link between ADHD and LDs has been extensively researched. Some studies have suggested that the two may have a common genetic link (Gilger, Pennington & DeFries, 1992; Stevenson, Pennington, Gilger, Defries, & Gillis, 1993; Tannock & Brown, 2000) while others have shown that the two disorders are transmitted independently (Doyle, Faraone, DuPre & Biederman, 2001; Faraone et. al., 1993). Chadwick, Taylor, Taylor, Heptinstall & Danckaerts (1999) found that early ADHD may predispose a child to develop reading problems but that early reading problems did not generally lead to the development of ADHD symptoms. However, Stevenson, Pennington, Gilder, DeFries and Gillis (1993) found a genetic link between ADHD and a Reading Disorder. This may be explained by the fact that early spelling ability involves good use of working memory, which has been shown to be an area of weakness for children with ADHD (Barkley, 2003).

As well as often experiencing Learning Disabilities, children with ADHD have also frequently been reported to have lower scores than controls on intelligence tests (Halperin & Gittelman, 1982; McGee, Williams, & Feehan, 1992; Peterson, Pine, Cohen, & Brook, 2001). However recent research is beginning to dispute this. Kaplan, Crawford, Dewey, and Fisher (2000) found that the IQ scores of children with ADHD were normally distributed.

Comorbidity in ADHD

Comorbidity is very common among those diagnosed with ADHD. Kadesio and Gillberg (2001) found that 87% of children with ADHD had a comorbid disorder and 67% have at least two comorbid disorders. The most common comorbid disorder for children diagnosed with the combined type of ADHD is Conduct Disorder. The prevalence rates for this have been found to be 20-50% in children, 44-50% in adolescence, and 26% in adulthood (Biederman, Faraone & Lapey, 1992; Lahey, McBurnett, & Loeber, 2000; Mannuzza & Klein, 1992).

Children with ADHD have also been reported to experience higher rates of depression and anxiety (Biederman, Faraone, Monuteaux, Bober, & Cadogen, 2004). In clinic referred samples comorbidity rates for anxiety have ranged from 10% to 40% (Tannock, 2000). However longitudinal studies have found that adolescents and adults with AHD have the same level of risk for developing anxiety disorders as controls (Mannuzza et. al., 1993; Weiss & Hechtman, 1993). With regard to unipolar depression, the comorbidity rates are between 20% and 30% (Biederman et. al., 1992). There remains a lot of controversy about the overlap between ADHD and bipolar disorder. It has been noted that 10-20% of children with ADHD may also have Bipolar Disorder (Spencer, Wilens, Biederman, Wozniak & Harding-Crawford, 2000). Although longitudinal studies of ADHD

have not indicated any increased risk of developing Bipolar Disorder within this group (Mannuzza et. al., 1993), a 4 year follow-up study showed that 12% of children with ADHD met criteria for Bipolar Disorder in adolescence (Biederman et.al, 1996). One explanation for the overlap between ADHD and Bipolar Disorder could be the similarity in symptoms across the two disorders, both involve hyperactivity, distractibility, and poor judgement (American Psychiatric Association, 2000). Spencer, Wilens, Biederman, Wozniak, and Harding-Crawford (2000) argue that the relationship between ADHD and Bipolar Disorder is unidirectional where ADHD does not seem to increase the risk of developing Bipolar Disorder, but a diagnosis of childhood Bipolar Disorder appears to dramatically increase the incidence of a prior or concurrent diagnosis of ADHD.

Health outcomes in ADHD

Children with ADHD have been reported to have significantly higher levels of asthma, allergies and upper respiratory infections than controls (Taylor, Sandberg, Thorley & Giles, 1991). They have also been reported by parents to be far more accident prone (Mori & Peterson, 1995), experience more physical injury (Hartsough & Lambert, 1985, Taylor et. al., 1991), involved in more car accidents (Barkley, Guevremont, Anastopoulos, Du Paul, & Shelton, 1993), and are more likely to speed while driving (Weiss & Hechtman, 1993) than controls.

Overall summary

In summary ADHD can be seen as a developmental neurocognitive disorder which impacts on both the education and social functioning of the individual. Due to their poor behavioural inhibition and self-regulation, the actions of these individuals are difficult to control through discipline and conventional cognitive-behavioural type treatments.

1.2 A brief description of creativity

The literature provides many varied definitions of creativity as it has been approached from numerous perspectives including behavioural, biological, clinical, cognitive, developmental, economic, and educational view points (Runco, 2004).Some authors see the creative process as an ability to generate remote associations, and display divergent thinking and rich imagery (e.g., Rothenberg, 1987; Simonton, 1997; Suler, 1980); while others see it as a form of logical problem solving (e.g., Klahr & Simon, 1999). The one area of agreement among writers on this topic is that creativity is demonstrated by some sort of novel outcome, whether it is a solution to a problem, a completed and communicable idea, or something tangible like a work of art or an invention (Pearlman, 1983; Akande, 1997; Piirto, 1998). Furthermore, it is widely accepted in the literature that all individuals possess, in some degree, creative ability. Creative acts can therefore be expected, no matter how feeble and infrequent, of almost all individuals (Runco, 1999). Isaksen (1987) noted that creativity occurs in many people, in differing degrees and manners, and should be viewed as "a multi-faceted phenomenon rather than as a single unitary construct capable of precise definition" (pg 8). Creativity can therefore be seen as a continuum on which all individuals fall. Simonton (2003) argues that scientific creativity can be conceptualised as a "quasi-random combinational process" (page 475), thus if it is random everyone working in a scientific field, should have chance to randomly produce a creative idea.

The current definitions of creativity involve a number of paradoxes, including: "(a) creativity involves difference from the everyday, yet is found in everybody; (b) novelty, the single essential element in creativity, is necessary but not sufficient to define it; (c) creativity is not the same as intelligence, but it is also not completely different; (d) creative

production requires deep knowledge, but freedom from its constraints; (e) creativity implies bringing something new into existence, but can be studied without reference to products; (f) creativity requires deviating from social norms, but doing so in a way that the society can tolerate; (g) creativity requires combining contradictory personality characteristics; and (h) opposite kinds of motivation lead to creativity" (Cropley, 1999, page 524).

The developmental course of creativity

Runco (1996) discusses the idea that creativity is a developmental process that changes over time. He sees creativity as a special combination of skills, requiring both maturity/experience and immaturity in the sense that one needs to be able to see things as if for the first time. He sees creativity as relying on a variety of traits, skills, and capacities, and argues that it is possible for some of the traits and skills to mature while others can remain relatively stable. He states that "the assumption of multidimensionality is necessary for the definition of creativity as manifested in the intentions and motivation to transform the objective world into original interpretations, coupled with the ability to decide when this is useful and when it is not" (Runco, 1996, pg 4).

In keeping with the idea that creativity is a developmental process, Cropley (1999) summarised the literature by stating that when looking at children's creativity, three phases of creativity have been described by researchers:

"(1) The Preconventional Phase (up to the ages of between 6 & 8 years). Preconventional creativity displays spontaneity and emotional involvement, and may lead to aesthetically pleasing products, but it is environmentally cued, because it is dominated by perception (especially visual) of the immediate concrete environment.

(2) The Conventional Phase (from 6-8 years to about 10-12 years). Conventional creativity involves thinking, but becomes increasingly rule bound and therefore stilted, as critical and evaluative skills develop.

(3) The Postconventional Phase (from about 12 years of age and extending to adulthood). The crucial element in postconventional creativity is that the individual takes account of external constraints and conventional values, but is able to produce novelty despite this" (pg 514).

Theoretical models of creativity

One of the earliest models of creativity was proposed by Wallas (1926), where he suggested that the creative process consists of four stages: 1. Preparation (where the individual becomes thoroughly familiar with a context area), 2. Incubation (where an individual churns through the information obtained in the preparation phase) – in this phase they do not remain intensely focused on the material, yet the issue is in the back of their mind while they attend to other problems or seek relaxation and recreation), 3. Illumination (where the individual comes up with a solution to the problem), and 4. Verification (where the individual seeks verification that their creative products are effective by evaluating the results of their application or presentation against established standards of excellence and personal criteria for success). Many of the more recent models of creativity are based on Wallas' original model. For example, Kirschenbaum (1998) developed the Creativity Classification System, which is based on Wallas' model but suggests that instead of Wallas' four phases, that there are nine interdependent dimensions of creative ability. These include contact (exploration, curiosity and openness to experience), consciousness (trying to collate diverse aspects into meaningful patterns), interest (being preoccupied with an area of interest), fantasy (generating ideas and transforming the familiar into the unfamiliar),

incubation (attending to other problems or seeking relaxation), creative contact (transformation of awareness), inspiration (feeling empowered to start working on a solution), production (gathering materials necessary to construct a solution), and verification (evaluation of results against established standards).

Based on Wallas and Kirschenbaum's models, creativity can be seen as essentially a problem solving process where the individual finds a novel solution to a perceived problem. This idea has been supported by research findings which have shown that creative children are particularly good at problem solving tasks (e.g., Carroll & Howieson, 1992; Kumar & Kumari, 1988; Maier & Janzen, 1969; Niaz & Saud de Nunez, 1991; Reiter-Palmon, Mumford, O'Connor Boes, & Runco, 1997). Yet, as Runco (2004) points out, "not all creativity involves problem solving, and not all problem solving requires creativity" (page680).

As well as being seen as good problem solvers, creative individuals have also been described as more open and susceptible to a wide array of information. A number of creativity theorists have argued that attention to a wide array of stimuli allows an individual to consider possibilities that they may miss if they had a more narrow focus (e.g., Eysenck, 1999; Simonton, 2003; Wallach, 1970) thus leading to their ability to come up with novel ideas.

Cognitive functioning in creativity

Numerous creativity theorists have argued that attention to a wide array of stimuli is essential to the creative process as it allows an individual to consider possibilities that they may miss if they had a more narrow focus (e.g., Eysenk, 1999; Martindale, 1996; Wallach, 1970). Further, research has shown that the creative individual's ability to filter out information appears to be impaired. Carson, Peterson and Higgins (2003) found that highly

creative individuals had lower scores on a measure of latent inhibition, which is the ability to filter out both internal and external stimuli previously experienced as irrelevant. They argued that it is this inability to filter out information, in combination with high IQ, that makes these individuals constantly open to much more information, increasing the chances of them coming up with an original recombination of information. Yet, contrary to these findings, Stavridou and Furnham (1996) and Green and Williams (1999), found that individuals with high divergent thinking ability had intact inhibition skills. Further, Gamble and Kellner (1968) and Golden (1975) found that creative individuals were less susceptible to interference than non-creative individuals, as measured by the Stroop task. Thus, it would appear that creative individuals may only have deficits in a particular type of inhibition, namely latent inhibition.

Social Functioning in creativity

As well as possibly displaying difficulties in cognitive functioning (i.e. focused attention), some authors have reported that highly creative individuals have deficiencies in their psychosocial functioning. They have been shown to experience more low mood (Hershman & Lieb, 1998; Papworth & James, 2003); higher anxiety (Carlsson, 2002; Carlsson, Wendt, & Risberg, 2000); and more difficulty with, or little interest in, establishing warm interpersonal relationships (Ochse, 1990) then controls. They have also been described as being raised in an environment that stresses independence, is less child-centred, has tense family relationships and experiences more negative affect than do non-creative, high achieving children (Olszewski, Kulieke, & Buescher, 1987). With regard to temperament, creative children have been described as moderately non-conforming, autonomous, and rebellious (Runco & Sakamoto, 1996). Yet, on the other hand authors have found no correlation between creativity and current depressive state (Sitton & Hughes, 1995); lower levels of anxiety in creative children compared to controls

(Asthana, 1993; Matejik, Kovac, & Kondas, 1988). They have shown that creative children are seen as the most popular in a group (Aranha, 1997; Lau & Li, 1996) and are not less sociable, cooperative, or more defiant and rebellious than their less creative peers (Smith & Moran, 1990). In relation to family environment, creative children have been described as having families that are better educated, more open to experiences, and have higher educational aspirations for their children, than those of non-creative children (Jausevek, 1981). Thus, the impact of high creative ability on an individuals psychosocial functioning is currently unclear in the literature.

Academic functioning in creativity

It has been stated in the literature that one can be creative without having high IQ, and be highly intelligent without being creative - however the two do often co-occur (Sternberg, 1999). Riaz (1979) investigated the links between creativity and academic achievement and found that creativity and achievement scores were significantly correlated, and that tests of creativity added significantly to the prediction of achievement over and above IQ test scores. Similarly, Altman (1999) found a highly significant link between creativity and academic success. Other studies have focused on the association between specific types of creativity and academic achievement domains and found links between some specific areas and not others. Ai (1999) investigated the relationship between creativity and the academic achievement of males compared with females in five areas (Spanish, Basque, English, Natural Science, Social Science and Mathematics). Results showed that high teacher ratings of creativity were associated with high academic achievement, for both male sand females, in all for subjects. In particular, for males, high scores in Flexibility were the prominent factor related to all 6 subjects and for females, high Elaboration was most strongly related with achievement in Spanish, Basque, English, and Social Science; and high Fluency was most strongly related with achievement in Natural

Science and Mathematics. Another study by Bawa and Kaur (1995) reported that creativity seemed to be more highly correlated with achievement in languages than in social studies and general science. Furthermore, they found that originality was more strongly associated with academic achievement than fluency and flexibility. In line with the idea that creativity was more strongly linked achievement in the language domain, Garaigordobil and Torres (1996) found that verbal creativity and academic achievement were significantly correlated. Yet, Simpson (1999) looked at the relationship between creativity and mathematics and reading achievement and found that it was not a significant predictor of achievement in these areas. Therefore the literature on the links between creativity and academic achievement remains contradictory and much scope for future, in depth analyses of the links between the different aspects of creativity and academic achievement remains.

Overall summary

In summary, creativity can be seen as a special problem finding and problem solving ability, where novel ideas are thought of and novel plans are implemented in order to solve a new or existing problem. Creativity is a developmentally dependent phenomenon where only from about 12 years of age on can an individual be deemed as truly creative. Before this age, only creative potential can be determined. Creativity appears to be linked with deficits in latent inhibition, and is possibly associated with deficits in psychosocial functioning although the research findings on this are contradictory to date.

1.3 The connection between ADHD and Creativity

Some authors have argued that there are distinct similarities between children who are diagnosed with ADHD and those who are creative (Shaw & Brown, 1991; Cramond, 1994; Lovecky, 1994; Guenther, 1995; Leroux & Levitt-Perlman, 2000). Shaw and Brown

(1991) found that ADHD children used more imagery in problem solving than did normal control children, and attained much higher scores on the figural creativity test than did controls. They suggested that ADHD children might generate novel or unusual ideas (i.e., show creativity) as a function of the different knowledge bases that they have acquired through their less focused interactions with their environments. Guenther (1995) noted that many of the symptoms of ADHD such as inattention, hyperactivity, impulsivity, difficult temperament, deficient social skills, and academic underachievement are also indicators of creative potential, and he cautions that a creativity test or checklist should always be completed in addition to the ADHD checklist. In accordance with this, Dawson (1997) found that teachers rated the following traits as typical of a creative child: "makes up the rules as he or she goes along," "is impulsive," "is a nonconformist," and "is emotional." The traits seen as least typical of the creative child were "is tolerant," "is practical," "is reliable," and "is good natured," similar ratings have been given in regard to children with ADHD. Lovecky (1994) is also concerned about the overlap in symptoms of ADHD and creativity and she argues that it is important to be able to distinguish between ADHD and giftedness because the way we treat a child with ADHD is certainly different to the way we treat a child who is overly excitable, gifted and passionate. Leroux and Levitt-Perlam (2000) have highlighted that studies of children with ADHD often emphasise the problems, diagnosis and treatment, but rarely consider the characteristics that are extraordinarily similar to creativity. They argue that in many cases gifts may mask the ADHD and the ADHD may mask the gifts. These authors propose that the lack of research available on gifted/ADHD children raises the possibility that many of these children are not being identified correctly.

As described earlier, the primary symptoms of ADHD are inattention, hyperactivity and impulsivity (American Psychiatric Association, 2000). These symptoms are also noted in the literature on creativity. There is however, a distinct difference in the description of these terms between the two bodies of literature. In the ADHD literature each characteristic is generally described with negative connotations whereas in the creative literature the same characteristic is described with positive connotations (Cramond, 1995). When describing inattention, ADHD children are depicted as easily distracted, often failing to complete tasks, and frequently changing activities (Lahey, et. al., 1988), and creative children are depicted as having a broad range of interests, showing a tendency to play with ideas and sometimes losing interest in one idea to take up another (Cramond, 1995). When describing hyperactivity, ADHD children are depicted as fidgeting excessively, having difficulty staying seated, running and climbing excessively, and having difficulty playing quietly (McBurnett, Lahey, & Pfiffner, 1993), and creative children are depicted as radiating vitality, having high energy levels, and having psychomotor overexcitability (Davis, 1986; Piechowski, 1986; Ochse, 1990). When describing impulsivity, ADHD children are depicted as frequently calling out in class, acting without thinking, engaging in dangerous activities without considering the outcome, and having difficulty awaiting a turn (McBurnett, Lahey & Pfiffner, 1993), and creative children are depicted as risk taking, thrill seeking, and with an innate temperamental trait of sensation seeking (Barron, 1988; Cramond, 1995).

In addition to these primary symptoms of ADHD, other characteristics include difficult temperament, deficient social skills and academic underachievement, all of which are seen among creative children as well (Kerr, 1985; Sternberg, 1988; Osche, 1990). Similar personality traits have been mentioned in the two bodies of literature, particularly in regard to risk taking behaviour. ADHD children are seen to often engage in physically

dangerous activities without considering possible consequences (American Psychological Association, 2000). Creative children have been described as willing to take chances (Barron, 1988) and having Type T personality, a personality dimension which characterizes individuals along a continuum ranging from those who are stimulated by risk-taking, stimulation-seeking and thrill-seeking (Big T) to those who are risk, stimulation, and thrill-avoiding (Little t) (Knutson & Farley, 1995). Shaw and Giambra (1993) noted that the inborn temperament of sensation seeking has been linked to both ADHD and creativity. ADHD children have a low sensory threshold and strong reactions to sensory stimuli (Barkley, 1998), the same has been said about creative individuals (Bachtold, 1980). Children with ADHD have been observed to have quick and drastic mood changes, and to exhibit a difficult temperament (Werry, Reeves & Elkind, 1987). Similarly, creative children seem to experience deep emotions (Sternberg, 1988) and to be emotionally unstable (Osche, 1990). Many creative and ADHD children are reported to suffer from depression or bipolar disorder (Herrshman & Lieb, 1988; Weinberg & Ernslie, 1990; Jamison, 1993). Finally, both ADHD and creative children have been noted to experience higher levels of anxiety than do control children (Carlsson, Wendt & Risberg, 2000; Waskowic & Cramer, 1999; Cox, 1999).

All of the above characteristics seen in both ADHD and creative children seem to have a negative impact on their psychosocial functioning. Dawson's (1997) work showed that teachers' descriptions of the ideal pupil seldom include those characteristics traditionally associated with creativity. Teachers valued traits such as being considerate of others, being obedient, being popular with peers, and being willing to accept judgements of authorities, all of which are not highly correlated with creativity. Numerous studies have mentioned the difficulties that teachers have in controlling ADHD children in the classroom

and therefore their negative perceptions of these children (Barkley, 1998). Past research has repeatedly shown that parents do not perceive the personality characteristics of their creative children favourably (Singh, 1987; Paguio, 1982; Raina, Kumar and Raina, 1980). Singh (1987) looked at the perceptions of Indian parents and found that "…. their unfavourable perception seems to be the result of non-permissive culture, rigid social norms and traditional value-patterns which do not permit children to deviate from the beaten social path. Obedience and conformity which stifle creativity are highly valued and prized traits of personality in India" (pg 42). Similarly, ADHD children are seen to be less compliant to parental requests and to request more assistance from their parents than do non- ADHD children. Therefore, parent-child relationships are strained and ADHD children receive more commands, reprimands and punishment (Barkley, 1998). ADHD children have also been reported to have negative social interactions with their peers (Barkley, 1998; Werry, Reeves & Elkind, 1987). Social skills are necessary for children to interact with each other yet many ADHD children do not have social skills comparable to their peers because they are not able to recognise social cues presented (Wolfle & French, 1990). The same has been noted in the creativity literature where these children are seen to have difficulty with, or little interest in, establishing warm interpersonal relationships (Ochse, 1990). Yet in contrast with this, several studies have shown that creative children are seen as the most popular in a group (Aranha, 1997; Lau & Li, 1996). Smith and Moran (1990) found that highly creative children were not less sociable, less cooperative, or more defiant and rebellious than their less creative peers, suggesting that highly creative children are not hampered socially or emotionally by this aspect of giftedness.

This dissertation proposes that the conflicting literature on the social acceptance of highly creative children may be due to the fact that there are two basic types of creative

children. Those who have behaviours very similar to ADHD children, and therefore are not socially accepted, and those who do not and therefore are socially accepted. It may be that the ADHD children and those creative children who display the same behaviours as ADHD children will display negative behaviours which will lead to them having low social acceptance, and low self-esteem. The creative children that display more positive behaviours will have high social acceptance and high self esteem.

Considering the many similarities between ADHD and creativity, the next step is to look at the nature of the relationship between these two phenomena. It is important to stress that not all creative children exhibit the behaviours to warrant an ADHD label and vice versa. Therefore, it is not creative and ADHD children as groups that can be difficult to distinguish but rather those individuals that exhibit behaviours that may be indicative of either condition. It is these children that run the risk of misdiagnosis.

It was in an attempt to begin looking at the nature of the relationship between ADHD and creativity that Cramond (1994a) proposed, based on the arguments put forward in the literature, that there should be a high incidence of creativity among children identified as having ADHD and also a high incidence of ADHD among children identified as highly creative. She tested a group of ADHD children for creativity using the Torrance Tests of Creative Thinking and found that 32% scored high enough to have qualified for a creative scholars programme. She also tested a group of creative children for ADHD and found that 26% meet diagnostic criteria for ADHD according to their self-reports. These percentages were significantly larger than what you would expect in the general population (Cramond, 1994a). This research showed that there is definitely an overlap in the symptoms of ADHD and creativity but the researcher did not look further and try to explain what might distinguish the two phenomena.

Although literature shows that both ADHD and creative children may display very similar behavioural manifestations, as well as some common etiologies, there has been no research on the similarities or differences in their cognitive functioning. Given that creativity is seen as a unique problem solving ability, one would assume that creative children have intact executive functioning abilities. Children with ADHD are believed to have problems with executive functions and thus one of the aims of this thesis is to determine whether the creative children displaying ADHD-like behaviour have similar executive functioning deficits, or whether the underlying mechanisms behind their behavioural manifestations are different to those underlying ADHD.

Zelazo, Carter, Reznick and Frye (1997) have proposed a problem solving model of executive functions. The model divides problem solving into four separate stages where each stage involves the mastery of different executive functions. The first stage, problem representation, involves being able to create perceptual sets (e.g., organise cards by colour and then by shape); using selective attention including both filtering (ignoring distracters) and priming (flexibility of attentional sets); and showing flexible use of scale models by having the ability to understand and use representations if the world to constrain their behaviour. The second stage, planning, involves having a well defined problem space with initial states, end states and operators; event planning; the ability to conduct a logical search; the ability to integrate and sequence behaviours in a novel way; planning to remember; and social planning where the possible impact of the behaviour on others is considered. The third stage, execution, involves intending, which is the ability to keep a plan in mind; and rule use for when plans are translated into action. The final stage, evaluation, involves knowing to terminate when the goal is achieved; error detection; and error correction.

This model of executive functioning appears to parallel Wallas' (1926) model of the creative process which was described earlier as involving preparation, incubation, illumination and verification. Table 1 depicts the two models, highlighting their similarities.

Table 1: Figure showing the cognitive processes involved in each stage of Wallas' (1926) model of the creative process and Zelazo et.al's (1997) model of the problem solving process.

Preparation Involves motivation, knowledge, remembering, integration, learning, and flexibility.	**Problem representation** Involves set creation, selective attention, and flexible use of scale models.
Incubation Involves convergent thinking, motivation, and problem finding skills.	**Planning** Involves finding a problem space, event planning, logical search, sequencing, planning to remember, and social planning.
Illumination Involves divergent thinking, openness, tolerance for ambiguity, rule use, and a willingness to take risks.	**Execution** Involves intending, and rule use
Verification Involves familiarity with norms and conventions, and evaluation of configurations of novelty.	**Evaluation** Involves termination, error detection, and error correction.

This dissertation suggests that, based on past literature in the field, children diagnosed as having ADHD will possibly be able to come up with novel ideas on how to solve a problem (Cramond, 1994a; Shaw & Brown, 1991) but they will have difficulties actually following through to solve the problem. They are predicted to be able to represent the problem but to have difficulties with planning, execution and evaluation due to their problems with executive functions (Barkley, 1998; Tannock, 1998). Therefore although children with ADHD may be shown to be highly creative when tested using tests that simply assess their ability to come up with novel ideas, there is the possibility that if they were tested on tests of planning, execution and evaluation abilities these children may fail due to their difficulties with the executive functions involved in these stages.

1.4 Aims of the present dissertation

This thesis aims to address four questions tested across three studies.

1. The aim of study one is to explore the creative abilities of children diagnosed with ADHD and to determine whether creativity is more highly represented in an ADHD population.
2. The first aim for study two is to examine the prevalence of ADHD symptomatology in a creative population, and to determine how many creative children met criteria for a diagnosis of ADHD. Based on the results of the first investigation, the second aim is to compare four groups: 1) children diagnosed with ADHD with normal levels of creativity, 2) creative children with ADHD symptoms, 3) creative children without ADHD symptoms, and 4) a normal control group, in order to assess whether the presence of ADHD symptomatology in creative children affects their cognitive functioning in ways similar to those displayed by ADHD children.

3. The aim of study three is to determine whether children displaying ADHD symptomatology experience similar psychosocial difficulties to those of children diagnosed with ADHD, and whether they have significantly more difficulties than those creative children who do not display ADHD symptomatology.

CHAPTER 2

GENERAL METHODOLOGY

2.1 Participants

A total of 93 children took part in the research pertaining to this dissertation. These children were divided up into various groups to make up the participants within each of the three studies that were written up. Overall 33 of the children recruited for this research had a diagnosis of ADHD, 30 were recruited as being highly creative and without a diagnosis of ADHD, and 30 were recruited as controls who were neither highly creative nor diagnosed with ADHD.

Participants for this dissertation were recruited over a twelve month period via advertisements in local newspapers, on doctors' notice boards, in school newsletters, the gifted children's society newsletter, and the ADD support group's newsletter. Those interested in taking part in the study were asked to phone the author of this dissertation who screened them for suitability to participate. If they were deemed appropriate they were sent out more detailed information about the study (see Appendix 4 for information sheets) and asked to phone back, if they were still interested once they had read this, and book a time bring their child in to the research lab.

With regard to the children recruited for their diagnosis of ADHD, the child needed a diagnosis of one of the three subtypes of the disorder (predominantly inattentive, predominantly hyperactive, or combined type). Due to the relatively small population in Christchurch and the difficulties in finding research participants with a diagnosis of ADHD it was too difficult to recruit a large enough number of children with each subtype of the disorder to divide them into separate groups by subtype.

Study 1

In the first study, 33 children with a diagnosis of ADHD and 34 control children took part.

Inclusion criteria for the ADHD group. In order to be selected for the study participants in the ADHD group needed to have received a prior diagnosis of ADHD from either a psychiatrist or registered psychologist. Then *T*-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the long versions of the parent and teacher forms of the Conners' Rating Scales-Revised (CRS-R; Connors, 1997) were used to confirm the ADHD diagnosis.

Exclusion criteria for the control group. All control children with *T*-scores above 65 on both the parent and teacher forms of the CRS-R were excluded. These criteria resulted in two participants being excluded from the control group, with one going on to receive a diagnosis of ADHD and then being included in the ADHD group.

Exclusion criteria for all groups. Individuals with an IQ score below 80, uncorrected problems in vision or hearing, serious medical problems such as epilepsy or cerebral palsy, or serious psychopathology, such as psychosis, that precluded an ability to diagnose ADHD accurately, and those where English was a second language, were excluded. These exclusion criteria did not result in the exclusion of any participants from the analysis.

Study 2 and Study 3

For studies two and three 29 children with ADHD, 30 highly creative children, and 30 control children took part. The group of highly creative children was divided into two subgroups of 12 children who displayed symptoms of ADHD (CA) and 18 who did not (CNA).

Inclusion criteria for the ADHD group. In order to be selected for the study participants in the ADHD group needed to have received a prior diagnosis of ADHD from either a psychiatrist or registered psychologist, and to have creativity (TTCT) scores below the 90th percentile. The ADHD diagnosis was confirmed by ensuring that each child gained *T*-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the long versions of the parent form of the Conners' Rating Scales-Revised (CPRS-R; Conners, 1997). Four children recruited for their ADHD diagnosis were excluded from the study due to their high TTCT scores (i.e. above 90th percentile).

Inclusion criteria for the CA group: Those children who scored in the 90th percentile or higher on the TTCT, and also had *T*-scores of 65 or above on the DSM-IV inattentive, DSM-IV hyperactive-impulsive, and/or DSM-IV total subscales of CPRS-R were included. A formal diagnosis of ADHD was not required for inclusion in this group as the aim of the study was to investigate those children exhibiting clinically elevated symptoms of ADHD in addition to being creative; excluding those not meeting full criteria would potentially eliminate those creative children driving the controversy between ADHD and creativity.

Inclusion criteria for the CNA group: This group was established by confirming that each child scored in the 90th percentile, or higher, on the TTCT and had *T*-scores below 60 on the CPRS-R.

Inclusion criteria for the control group: In order to be in the control children had to have *T*-scores below 60 on CPRS–R, and TTCT scores below the 90th percentile.

Exclusion criteria for all groups: Individuals with an estimated IQ score below 80, English as a second language, uncorrected problems in vision or hearing, serious medical problems, or serious psychopathology were excluded. These criteria did not result in the exclusion of any participants.

2.2 Measures

The children, parents and teachers each completed various measures across the three studies. The children completed measures of creativity (Torrance Tests of Creative thinking, and Maier's two-string problem), IQ (Block Design and Vocabulary subtests of the Weschler Intelligence Scale for Children: WISC-III), neurocognitve functioning (WISC-III: Coding, Symbol Search, Digit Span, and Arithmetic; Rapid Automatized Naming task, Stop task, Stroop task, Stroop Negative Priming task, and Tower of London), and psychosocial functioning (Rosenberg Self-Esteem Scale, Revised Child manifest Anxiety Scale, and Child Depression Inventory). See Appendix 1 for copies of these measures. The parents completed measures of ADHD (Conners' Parent Rating Scale), general behavior (Child Behavior Checklist), temperament (Junior Temperament and Character Inventory), family environment (Family Environment Scale), and mothers' attributions about their children (Parent version of the Kastan Children's Attributional Style Questionnaire). See Appendix 2 for copies of these measures. The teachers completed measures of ADHD (Conners' Teacher Rating Scale) and general behavior (Teacher Report Form). See Appendix 3 for copies of these measures.

The measures used within the three studies that make up this dissertation were selected for their suitability for assessing children, and for their good previous reliability and validity statistics. Various indicators of the psychometric properties (reliability and validity) of each measure have been obtained from the literature and are reported within the individual studies that comprise this dissertation. Given that the most important theoretical constructs in this dissertation were the measures of ADHD and creativity, specific analyses of the reliability of these measures were undertaken with the data collected for the current research. The internal reliability of the five subscales that make up the total score on the

TTCT was indicted by the overall Cronbach's Standardized Alpha, which was 0.797, suggesting good internal reliability. Furthermore, inter-item correlations of the five subscales that make up the TTCT showed strong correlations between each subscale and the total score (fluency, r = 0.55; originality, r = 0.70; elaboration, r = 0.80; abstractness of titles, r = 0.79; resistance to premature closure, r = 0.66). Thus the total score on the TTCT was used as the predominant measure of creativity across the three studies with individual analysis of the five subscales only being conducted in study one. The internal reliability of the subscales that make up each of the subtypes of ADHD on the Conners' Parent Rating Scales was indicted by the overall Cronbach's Standardized Alpha values and inter-item correlations. Reliability of the Conners' Teacher Rating Scale was not assessed as it was not used to indicate ADHD due to the high rates of medication use in the ADHD group and alternative schooling in the creative group. For the inattentive subtype the Cronbach's Standardized Alpha value was 0.884, indicating good internal reliability. The inter-item correlations of the five subscales that could indicate symptoms of the inattentive subtype showed strong correlations between each subscale and the DSM-IV inattentive score (cognitive problems/inattention, r=0.94; anxious-shy, r=0.53; perfectionism, r=0.37; social problems, r=0.70; psychosomatic, r=0.50). The inter-item correlations of the four subscales that could indicate symptoms of the hyperactive subtype showed strong correlations between each subscale and the DSM-IV hyperactive-impulsive score (oppositional, r=0.82; hyperactivity, r=0.97; social problems, r=0.70; Conners' global index: restless-impulsive, r=0.93). The inter-item correlations of the ten subscales that could indicate symptoms of the combined subtype showed strong correlations between each subscale and the DSM-IV total score (oppositional, r=0.82; cognitive problems/inattention, r=0.93; hyperactivity, r=0.91; anxious-shy, r=0.59; perfectionism, r=0.459; social problems, r=0.75; psychosomatic, r=0.564; Conners' ADHD index, r=0.97; Conners' global index: restless-impulsive, r=0.95;

Conners' global index: emotional lability, r=0.268). Thus the DSM-IV score for each subtype of ADHD was used as the predominant measure of ADHD across the three studies.

2.3 Procedure

Participation in this research involved the parents and teachers being sent out questionnaires in the mail that they were asked to fill in, in their own time, and then return in a prepaid envelope. The children were asked to come to the Psychology Department at the University of Canterbury for one 4.5hour session in order to complete all of their measures. Each child was tested individually, in a quiet room, by the author of this dissertation. The reason for doing all of the testing in one session was to avoid the situation where participants did not attention all of the individual sessions and thus their data would not be able to be used. To allow for the effects of fatigue each child completed the measures in the exact same order to try and ensure similar testing conditions. Furthermore the children were given regular breaks where food and drink were provided and they went on a short walk around the campus. Children were also told that if they got too tired and wanted to stop they could do so at any time and we would schedule another time for them to come back and complete the study. None of the children requested to end the session early.

Before starting the session the parents completed a consent form to give permission for their child to take part, and the children signed an assessment form ageing to take part (see Appendix 4). At the end of the testing session each child received $10 for their participation. Parents of the children with ADHD were given a booklet which reviewed the latest research findings on ADHD and provided information on all the services in Christchurch that were available to assist parents of, and children with, ADHD.

The procedure for this study was approved by the University of Canterbury Human Ethics committee (see Appendix 5).

2.4 Statistical Analyses

Descriptive Statistics

Numerous descriptive statistics were calculated to describe the nature of the data. Firstly, descriptors of the distributions were calculated. Means and Standard deviations were used to provide information on the distribution of variables. Further, Shapiro-Wilks tests were used to provide information about whether or not the data on each variable was normally distributed. Secondly, given that the sample size (particularly in studies 2 & 3) was small, effect sizes were employed to gauge the magnitude of the difference between groups. Finally, correlations were computed when the nature of the relationship between two variables was being investigated.

Inferential Statistics for Study 1

The inferential statistics used in Study 1 were ANOVA, T-test and Chi-Square. T-Tests were used to identify whether there was a difference between groups, when only two variables were under comparison. A factorial ANOVA was used to examine interaction effects across particular variables, and a MANOVA was employed when several related dependant variables were under examination. When the MANOVA showed an overall significant difference among groups, it was followed up with a series of t-tests to examine group differences on each dependent variable individually. A Chi-Square test of independence was utilised to examine group differences when variables contained dichotomous data.

All variables examined using the previously mentioned tests had their means and standard deviation examined, and Shapiro-Wilks test of Normality conducted on them, to ensure they did not violate the assumptions of the various parametric null-hypothesis significance tests employed (i.e., homogeneity of variance, and normality of distribution).

As is standard in psychology, a probability level cut off score of $p < 0.05$ was used to indicate a significant difference between groups.

Inferential Statistics for Study 2 and Study 3

One-way ANOVAs and Chi-Sqaure tests of independence were used to analyse the data in these two studies. One-way univariate ANOVA were employed to examine the variation among the means of each variable across the four groups of children that took part in these studies, and to see whether there was an overall significant difference between the groups. Following each ANOVA, Tukey post-hoc tests were employed to investigate which, if any, of the four groups were significantly different from each other. Chi-Square tests of independence were used in order to examine group differences when the data was dichotomous.

As in study 1, ANOVAs were tested for violation of assumptions using Shapiro-Wilks tests of normality. Furthermore, as is standard in psychology, a probability level cut off score of $p < 0.05$ was used to indicate a significant difference between groups.

CHAPTER 3

STUDY 1: AN EXPLORATION INTO THE CREATIVE ABILITIES OF CHILDREN WITH ADHD[1].

3.1 Abstract

The purpose of this study was to explore whether ADHD was associated with high creative ability. Sixty seven children aged 10-12 years old: 33 ADHD and 34 controls, completed the TTCT, Maier's Two-String Problem, and the Block Design and Vocabulary subsets of the WISC III. The results showed that there was no significant difference between the ADHD and control group's performance on either the Torrance Tests of Creative Thinking, Maier's Two-String Problem, or WISC III, suggesting that children diagnosed with ADHD are no more creative than children without the diagnosis.

3.2 Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent and vigorously studied psychiatric conditions in child psychology. It is conservatively estimated to occur in 3-6% of children from varied cultures and geographical regions, with an overrepresentation of boys by approximately 3:1 (American Psychiatric Association, 2000). ADHD affects individuals throughout the lifespan, although there are age and gender related changes in its manifestation (Weiss & Hechtman, 1993; Barkley, 1998; Tannock, 1998).

[1]**Published paper:** Healey, D., & Rucklidge, J.J. (2005). An exploration into the creative abilities of children with ADHD. *Journal of Attention Disorders, 8(3),* 88-95.

Despite the large amount of research into this disorder, there continue to be a number of gaps in our knowledge of ADHD. Furthermore, Kaplan (1998) has suggested that there are several myths about ADHD that have arisen over the years. For example, Kaplan, Dewey, Crawford and Fisher (1998) showed that children with ADHD do not necessarily have memory problems; Gaitens, Kaplan and Freigang (1998) found that ADHD children do not have more immunoglobulin E (IgE) mediated allergies than controls; and Kaplan, Crawford, Dewey, and Fisher (2000) found that the IQ scores of children with ADHD were normally distributed.

Some literature has suggested that children with ADHD have unusually high creative abilities. Most of the literature in this field is theoretical, focusing on descriptions of creative persons, commenting on reasons why ADHD and creativity may overlap, and cautioning against misdiagnosis; however only a few empirical studies have been done. A number of authors have mentioned the idea that creativity is linked to ADHD. Hallowell and Ratey (1994) listed 20 suggested criteria for adult ADHD, one of which was "often creative, intuitive, highly intelligent...." (p. 74). Guether (1995) noted that many of the symptoms of ADHD such as inattention, hyperactivity, impulsivity, difficult temperament, deficient social skills, and academic underachievement are also indicators of creative potential, and he cautions that a creativity test or checklist should always be completed in addition to the ADHD checklist. Leroux and Levitt-Perlam (2000) have highlighted that studies of children with ADHD often emphasise the problems, diagnosis, and treatment; but rarely consider the characteristics that have been explained as being remarkably similar to creativity. They argue that in many cases, gifts may mask the ADHD and the ADHD may mask the gifts. These authors propose that the lack of research available on gifted/ADHD children raises the possibility that many ADHD and/or gifted children are not being identified correctly.

Shaw and Brown (1991) tested 16 ADHD and 16 control children matched on age, sex and intelligence. They found that ADHD children used more imagery in problem solving than did normal control children, and attained much higher scores on the figural creativity test than did controls. They suggested that ADHD children might generate novel or unusual ideas (i.e., show creativity) as a function of the different knowledge bases that they have acquired through their less focused interactions with their environments. However, a serious methodological limitation of this study was that the children placed in the ADHD group were not necessarily diagnosed as having ADHD. Group allocation was done on the basis of up to four (average 2.5) teachers' ratings on the Conners' Abbreviated Teacher Rating Scale (Conners, 1973), thereby not assessing to ensure pervasiveness of symptoms across settings. Also, they only tested children with high IQs (i.e. a score of 115 or above).

Cramond (1994a) tested a group of 34 ADHD children for creativity using the figural form of the Torrance Tests of Creative thinking (TTCT, Torrance, 1962) and found that although the group performed at about the mean on the TTCT, 32% of the children scored above the 90th percentile, and half above the 70th percentile. However, a significant limitation of this study was that the author had no control over whether or not the ADHD children were medicated during testing. As ADHD medications are known to improve concentration and cognitive functioning (Berman, Douglas & Barr, 1999), it is not clear whether as many children would have done as well on the test if they had not been medicated. Another important limitation was that there seemed to be a large number of very intelligent children in the ADHD group, 6 of the 11 children with ADHD who scored above the 90th percentile on TTCT had also been screened for, or placed in, a gifted scholars program. Thus, it may be that the ADHD sample was not representative of the population

of ADHD children. Further, the diagnostic procedure for ADHD children was quite heterogeneous without any confirmation of diagnosis within the study design.

In contrast to the findings that ADHD children are especially creative, Sang, Yu, Zhangming, and Yu (2002) tested a group of 8 year old children diagnosed with ADHD and a group of control children on the Creativity Ability Test. In addition, their language, general science and mathematics teachers were asked to evaluate their creativity. They found no differences between groups on the Creative Ability Test, nor in the creativity evaluated by the teachers. Again, a serious methodological limitation of this study was that the children placed in the ADHD group were not necessarily diagnosed as having ADHD. Group allocation was done solely on the basis of one teacher's ratings of hyperactivity on a DSM-IV evaluation form, thereby not assessing to ensure pervasiveness of symptoms across settings, nor assessing adequately for inattentive symptoms. Similarly, Alt (1999) tested adults with and without a diagnosis of ADHD on the TTCT and found no significant difference between the groups.

Taking the current theories about ADHD and creativity into account, one would expect that ADHD children would be unlikely to be unusually creative. One of the main theories in the literature is that children with ADHD have deficits in executive functioning (Barkley, 1998). Looking at the cognitive processes involved in creativity, it is clear that executive functioning is an important part in the creative process. A comparison of Zelazo, Carter, Reznick and Frye's (1997) model of executive functioning and Wallas' (1926) model of creativity shows the similarity between the processes involved in executive functioning and those involved in creativity. The *preparation* and *incubation* phases in Wallas' model and the *problem representation* phase of Zelazo et. al.'s model both involve collection and structuring of knowledge so that a clear problem is defined; the *illumination* stage of Wallas' model and the *planning and execution stages* of Zelazo et al.'s model all

involve coming up with a solution and implementing it; and the *verification* phase of Wallas' model and the *evaluation* phase of Zelazo et al.'s both involve evaluation of the end product. If indeed the processes involved in the four stages of these two models are the same, then the creative process should include the executive functions involved in problem solving. In turn, one would expect that children with ADHD are unlikely to be highly creative as they would experience some difficulties with creativity as a result of their executive functioning deficits (Pennington & Ozonoff, 1996; Tannock, 1998). Since creativity is likely to involve more than executive functioning alone, ADHD children should be able to express some creativity, but possibly not extremely high creative ability due to their deficits in executive functioning.

Due to the controversy in the literature as well as the methodological problems present in many of the studies (such as testing children while on medications, not accurately assessing ADHD, the use of different measures of creativity, and testing children with high IQs), it continues to be unclear whether ADHD children have unusually high creative ability. It may be that this is yet another one of the "myths about ADHD". We have seen that the IQs of ADHD children appear to be normally distributed (Kaplan et. al., 2000) and although it has been posited by the threshold theory that creativity and IQ are correlated up until an IQ of 120 (e.g. Albert & Elliot, 1973; Barron, 1969), empirical investigations of this theory have resulted in contradictory and inconclusive results. It appears that results differ depending on the measures of both creativity and IQ/achievement that are used (Runco & Albert, 1986). For example, a study by Marcelino (2001) showed that IQ (as measured by the WISC) and Torrance Test of Creativity scores were not significantly correlated; where as Guilford and Christensen (1973) used Lorge-Thorndike IQ scores (Lorge & Thorndike, 1957) and five divergent thinking tests and found that "the higher the IQ, the more likely we are to find at least some individuals with high creative potential" (p.

251). Further, it has been stated in the literature that one can be creative without having high IQ, and be highly intelligent without being creative (Sternberg, 1999). Thus, it is important to differentiate creativity from IQ and investigate it as a separate domain.

The aim of this study was to determine whether the creative abilities of children diagnosed with ADHD, unmedicated at the time of testing, are evenly distributed, and to determine whether creativity is more highly represented in an ADHD population.

3.3 Method

Participants

Sixty seven children aged between 10 and 12 years old took part in the research. The children were divided into two groups: 33 (23 male, 10 female) were diagnosed with ADHD: and 34 (16 male, 18 female) were classified as controls with no indication of ADHD. Participants were predominantly Caucasian of varying S.E.S. backgrounds, residing in Christchurch, New Zealand. Recruitment was conducted through advertisements in local newspapers, school notices, and an ADD support group newsletter.

Inclusion criteria for the ADHD group. The ADHD group was established by confirming that each child was diagnosed with ADHD by a psychiatrist or registered psychologist. *T*-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the long versions of the parent and teacher forms of the Conners' Rating Scales-Revised (CRS-R; Connors, 1997) were used to confirm the ADHD diagnosis. In those cases where the child was medicated (n=30), normal scores on the teacher rating forms did not disconfirm an ADHD diagnosis.

Exclusion criteria for the control group. All control children with *T*-scores above 65 on both the parent and teacher forms of the CRS-R were excluded. These criteria

resulted in two participants being excluded from the control group, with one going on to receive a diagnosis of ADHD and then being included in the ADHD group.

Exclusion criteria for all groups. Individuals with an IQ score below 80, using the Block Design and Vocabulary subtests of the WISC-III (Wechsler, 1991), with uncorrected problems in vision or hearing, serious medical problems such as epilepsy or cerebral palsy, or serious psychopathology, such as psychosis, that precluded an ability to diagnose ADHD accurately, and those where English was a second language, were excluded. These exclusion criteria did not result in the exclusion of any participants from the analysis.

Dependent measures

Creativity. Creative potential was measured using the TTCT, Figural Form A (Torrance, 1962) which is made up of three tasks, all of which involve coming up with unusual drawings that have standard shapes (e.g. a pair of straight lines) as a part of them. Each drawing is scored on 5 subscales: originality, fluency, elaboration, abstractness of titles, and resistance to premature closure. The final percentile ranking is based on a combination of the scores for the 5 subscales as well as additional aspects like humour, emotional expressiveness, and richness of imagery. The reliability of this measure is high, with correlations generally above .90 (Torrance, 1998). Torrance (1981) conducted a 22 year longitudinal study on the predictive validity of this measure, which compared scores from various forms of the TTCT with later life creative achievements. An overall creativity index score was devised based on participants' performance on the creativity tests. The creativity index was correlated with five indices of creative achievement and the product moment correlation coefficients were all significant at the 0.001 level. These indices included: number of high school creative achievements ($r = 0.38$), number of post high school creative achievements ($r = 0.46$), number of creative style of living achievements (r

= 0.47), quality of highest creative achievements (r = 0.58), and quality of future career image (r = 0.57).

Idea generation and abstract thinking. Insight and abstractness of thinking was tested using Maier's Two-String problem (Maier, 1931) which has been characterised as being high in novelty and having considerable ecological validity in being close to real life problems (Kaufman, 1974; Kaufman, 1979). According to Greeno (1978), solving this task involves basic cognitive processes such as search and restructuring. Furthermore, this task has been linked to processes of creativity (e.g. Maier, 1970). For this task, two pieces of string were hung from the ceiling on either side of a room. The strings were not long enough to be able to hold one and reach to grab the other. The children were given a number of tools that they could use to help tie the strings together and were asked to think of as many different ways as they could to use the tools to tie the strings. The number of ideas was recorded as one measure. The particular idea of using one of the tools, a spanner, as a pendulum was scored as a separate measure as use of this tool indicated a high level of abstract thinking ability.

Intelligence. IQ was estimated using the block design and vocabulary subsets of the Wechsler Intelligence Scale for Children (WISC-III; Welschler, 1991) which when combined are good indicators of Full Scale IQ (Sattler, 2002). This combination of subtests has been found to correlate highly with the full WISC III test, with $r = .862$ (Sattler, 2002).

Procedure

Each child was tested individually for 1.5 hours in a quiet room at the university. Ethics approval for the study was gained from the local Human Ethics Committee. Participation was voluntary and included parental and child consent. Ninety percent (n=30) of the children diagnosed with ADHD were taking medication (methylphenidate) for the disorder and were asked not to take it 24 hours prior to the day of testing. On the day of

testing, it was confirmed with parents that the child had not been given their methylphenidate that morning. As methylphenidate has an approximate half-life of 4.5 hours (Shader, Harmatz, Oesterheld, Parmelee, Sallee, & Greenblatt, 1999), a 24 hour elimination period should have ensured that the majority of the active ingredient had been eliminated prior to testing. Parents were asked to fill in the Conners' Parent Rating Scale and permission was gained to send the Conners' Teacher Rating Scale to a current teacher that knew the child well (See Table 1 for Conners' Scores).

Table 1. Descriptive statistics for ADHD and control groups' scores on the Conners Rating Scales – Revised.

Variables	**ADHD (n = 33)**		**Control (n = 34)**			
	Mean	*SD*	*Mean*	*SD*	t (65)	Cohen's *d*
CPRS-R subscales (*T-scores*)						
Inattentive	74.91	9.02	47.78	5.43	13.86***	3.64
Hyperactive	82.59	8.39	47.64	4.77	19.44***	5.12
DSM IV Total	81.25	7.34	47.54	4.78	20.75***	5.44
CTRS-R subscales (*T-scores*)						
Inattentive	56.57	10.21	45.23	3.80	5.24***	1.47
Hyperactive	56.67	13.48	45.04	5.37	4.03***	1.13
DSM IV Total	57.33	12.47	44.65	3.87	4.91***	1.37

Note: $p<0.001$***

3.4 Results

To ensure that IQ was not a mitigating factor in the creativity results, the distributions of the estimated IQ scores of both groups were compared. The Shapiro-Wilk test was used to determine whether the distributions were normally distributed. Non significant results for this test mean that the distribution of the IQ scores does not differ

from a normal distribution. For both the ADHD group (W= 0.956, *ns*) and the control group (W = 0.964, *ns*), IQ scores did not differ significantly from a normal distribution. An independent samples t-test was conducted to determine whether there were any significant differences between the ADHD and control groups on IQ. No significant differences were found between the ADHD (M= 109.73, SD = 13.95) and control (M = 115.62, SD = 12.05) groups for the estimated full scale IQ score, t (65) = 1.85, *ns*.

Given that the past studies that have found a relationship between ADHD and creativity used children with high IQs, and that the threshold theory argues that IQ and creativity are correlated up to an IQ of approximately 120, the relationship between ADHD and IQ was examined further. A Factorial ANOVA, testing for an IQ by ADHD interaction on TTCT percentile scores was conducted and results showed that there was no significant interaction between ADHD and IQ (F(1,63) = .26, p=0.61). Further TTCT and IQ were not significantly correlated (r = 0.11, ns).

The Shapiro-Wilk test was also used to determine whether the distributions of the TTCT and Maier's Two-String problem scores for each group were normally distributed. For both the ADHD group (W = 0.947, *ns*) and the control group (W = 0.962, *ns*), TTCT scores did not differ significantly from a normal distribution. In contrast, for both the ADHD group (W = 0.851, $p < 0.001$) and the control group (W= 0.876, $p < 0.001$), Maier's Two-String problem scores did differ significantly from a normal distribution as both were positively skewed, with a small number of ideas generated being the most frequent occurrence. One would expect children who are not particularly creative to be unable to come up with a large number of varying ideas on how to solve this problem. See Figures 1 and 2 below for distributions of TTCT and Maier's Two-String Problem scores.

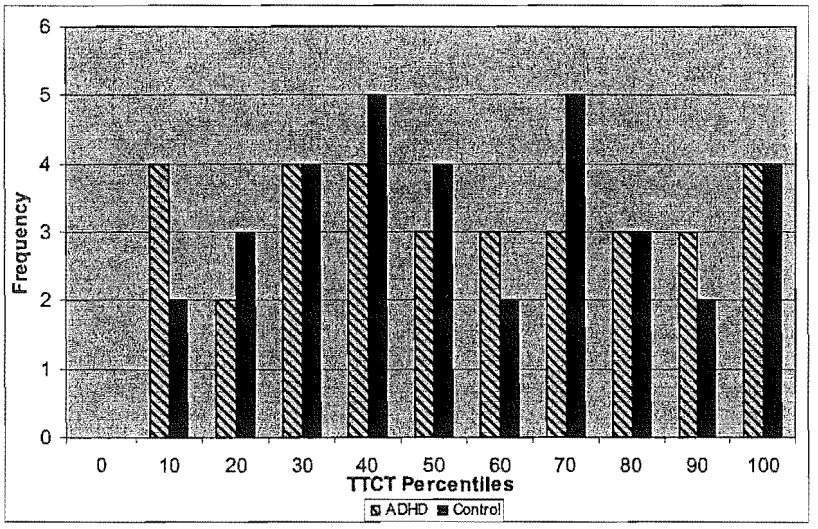

Figure 1. Distribution of TTCT percentile scores for the ADHD and control groups

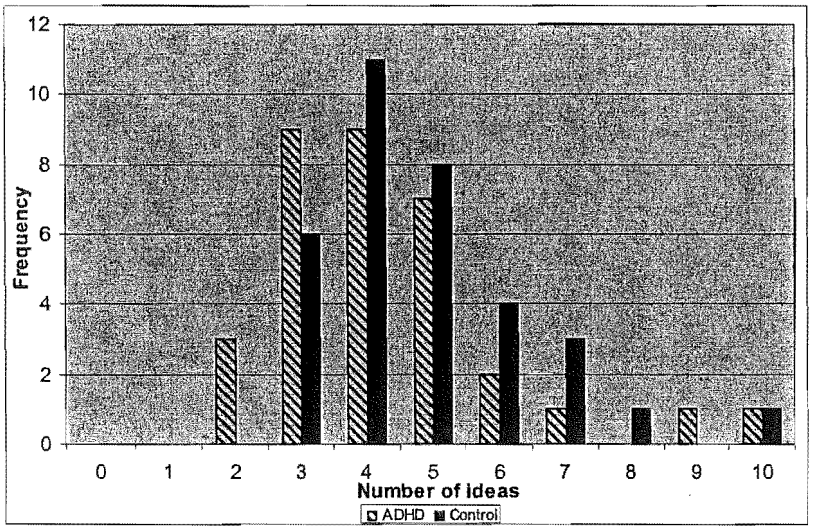

Figure 2. Distribution of ideas on Maier's Two-String Problem for the ADHD and control groups.

A number of independent sample *t*-tests were conducted to determine whether there were any significant differences between the ADHD and control groups on creativity. No significant differences were found between the ADHD ($M = 49.06$, $SD = 30.04$) and control ($M = 50$, $SD = 27.61$) groups for the total score on the TTCT, $t\ (65) = 0.13$, *ns*. Similarly, no difference between the ADHD ($M = 4.30$, $SD = 1.79$) and control ($M = 4.85$, $SD = 1.60$)

groups was found for Maier's Two-String problem, $t(65) = 1.51$, *ns*. Effect size calculations further confirmed that there was no difference in creative ability between the two groups. For TTCT, the Cohen's *d* effect size value was 0.03 and for number of ideas on Maier's Two-String problem, *d* was 0.32.

A MANOVA was used to examine group differences on the five TTCT indices of creative potential (i.e., fluency, originality, elaboration, abstractness of titles, and resistance to closure scales). The overall effect for group was significant, Wilk's Lambda $F(4, 61) = 3.26$, $p < 0.05$), yet four of the univariate *F*-tests for the five individual scales were not significant. The only significant difference was on the elaboration subscale of the test where the control children showed significantly more elaboration in their drawings than did the children with ADHD. Univariate *F* values, descriptive statistics and Cohen's *d* effect sizes are presented in Table 2.

Table 2. Descriptive statistics for ADHD and control groups' on the TTCT.

TTCT subscales (percentiles)	**ADHD (n = 33)**		**Control (n = 34)**			
	Mean	*SD*	*Mean*	*SD*	*F* (4, 61)	Cohen's *d*
Fluency	47.09	29.97	37.63	24.04	2.00	0.34
Originality	45.39	31.56	42.09	23.56	0.23	0.12
Elaboration	38.76	29.20	62.24	30.30	10.25**	0.79
Abstractness of titles	54.76	39.78	64.84	29.80	1.36	0.28
Resistance to premature closure	37.00	28.81	31.42	21.67	0.79	0.24

Note: $p < 0.01$**

A chi square test was used to determine whether there was a group difference in the number of children who thought to use the wrench as a pendulum in order to tie the pieces of string together in Maier's Two-String problem, and no significant difference was found

$\chi^2 = 0.14$, *ns*. Seven children with ADHD (21%) and six control children (17.6%) thought to use the pendulum.

It is important to consider whether the lack of significant group differences found in this study is a function of sample size, or whether it implies that no effect is present. A power analysis, based on the effect size between ADHD and control on the TTCT ($d =$ 0.03, small by Cohen's convention) and a sample size of 34, yielded a power statistic of .19 using a table indicating approximate power for studies using the t-test for independent means (Aron & Aron, 1994). Increasing the sample size to 100, based on a small effect, only yielded a 20% increase in power (.41). This would suggest that either, there is no effect, or that if indeed there is an effect it is so small that a very large sample would be needed in order to detect it.

3.5 Discussion

This study determined that the creative abilities of children with ADHD, as measured by the TTCT, are evenly distributed. Furthermore, no group differences were found between ADHD and control children on IQ, creativity, idea generation, and abstract thinking, suggesting that high creative ability is not a common feature of ADHD. Instead ADHD children are just as creative as normal control children. Due to the overall lack of significant group differences in creativity, between ADHD and control groups, the results of this study can be used to argue against the idea that increased creativity is a positive aspect of ADHD.

These findings support the research by Sang et al. (2002) and Alt (1999) and further extend them by using children who had been diagnosed with ADHD by a psychiatrist or psychologist. Further, the children were unmedicated at the time of testing to ensure that

their creative ability was tested without the cognitive enhancing effects of stimulant medications.

The results of this study differ from the findings of Cramond (1994) and Shaw and Brown (1991). Although Cramond's (1994) ADHD group performed around the mean overall, she did find that 32% of the ADHD children scored above the 90th percentile. In this study, only 12% of the children diagnosed with ADHD scored above the 90th percentile. Furthermore, whereas Cramond found that the only elevation for the ADHD group was on the elaboration subscale of the TTCT, with the mean falling above average, the opposite result was found in this study where the only significant difference between the control and ADHD groups was for elaboration, with the control group showing greater skill.

Despite a number of authors commenting on the similarities in behavior, temperament, and psychosocial functioning of children with ADHD and those who are highly creative (e.g., Cramond, 1994; Guether, 1995), the results of this study suggest that one cannot conclude that children with ADHD are more likely to be creative than those without. Specific behavioral manifestations, temperamental dispositions, and degrees of psychosocial functioning alone do not appear to lead to creativity. Furthermore, although it appears that the creative process involves mastery of a number of executive functions, as discussed in the introduction, and current theories of ADHD suggest that individuals with this disorder have difficulties with executive functioning, children with ADHD do not appear to be any less creative than same aged peers. Therefore, executive functioning alone cannot solely account for what is involved in the creative process.

With regard to the threshold theory, our results do not support the theory and are in line with the findings of Marcelino (2001) who found no correlation between WISC and TTCT scores, and Runco and Albert (1986) who ran correlations between numerous

measures of creativity and intelligence and did not support the threshold theory with their results.

Limitations

There are a number of limitations that hinder the generalizability of these results. First, the TTCT is believed to be a measure of creative potential only, thus scores on this measure are an indicator of an individual's potential ability to create rather than their creativity as such. Second, children in the ADHD group were not assessed using a standardized interview often used in research. Third, only a small sample of control and ADHD children were used in the study. Power calculations indicated that, based on the small effect found in this study, future studies would need to include large sample sizes of over 100 children in order to detect a difference between the creative ability of ADHD and control children, if indeed one does exist. Finally, although children did not take their methylphenidate on the day of testing, we cannot confirm that all traces of stimulants had been eliminated by this procedure. While it has been a method used in other studies (e.g., Berman et al., 1999; Rucklidge & Tannock, 2002), only assays could confirm whether the medication was definitively eliminated.

Suggestions for further research

It has been noted that the use of different measures of creativity can yield different research findings (Runco & Albert, 1986) thus future research will need to use a larger range of creativity measures in order to fully explore the relationship between ADHD and creativity. Further, the effects of methylphenidate on creativity have not been explored. Given that past studies testing children with ADHD who were on medication at the time of testing found that children with ADHD were more creative than controls, it would be important to ascertain what effect methylphenidate has on creativity. Finally, although this study has shown that children with ADHD do not appear to be more creative then control,

research has also shown that creative children display many of the same behavioural manifestations as seen in ADHD (Cramond, 1994). This study did not explore the ADHD symptomatology within a creative sample. Future research could investigate whether similar cognitive deficits are related to the behaviours seen in ADHD and creative children. The literature on ADHD suggests that deficits in behavioural inhibition may be underlying the behaviours we see in this population (Barkley, 1998), and the literature on creativity has shown that highly creative individuals have deficits in latent inhibition (Carson, Peterson & Higgins, 2003). Thus it may be that similar causal mechanisms underlie the behaviours seen in ADHD and creative children.

CHAPTER 4

STUDY 2: AN INVESTIGATION INTO THE RELATIONSHIP AMONG ADHD SYMPTOMATOLOGY, CREATIVITY, AND NEUROPSYCHOLOGICAL FUNCTIONING IN CHILDREN[1].

4.1 Abstract

This paper examined the relationship between creativity and ADHD symptomatology. First, the presence of ADHD symptomatology within a creative sample was explored. Secondly, the relationship between cognitive functioning and ADHD symptomatology was examined by comparing four groups, aged 10-12 years: 1) 29 ADHD children without creativity, 2) 12 creative children with ADHD symptomatology, 3) 18 creative children without ADHD symptomatology, and 4) 30 controls. Creativity, intelligence, processing speed, reaction time, working memory, and inhibitory control were measured. Results showed that 40% of the creative children displayed clinically elevated levels of ADHD symptomatology, but none met full criteria for ADHD. With regard to cognitive functioning, both ADHD and creative children with ADHD symptoms had deficits in naming speed, processing speed, and reaction time. For all other cognitive measures the creative group with ADHD symptoms outperformed the ADHD group. These findings have implications for the development and management of creative children.

[1]**Published Paper:** Healey, D., & Rucklidge, J.J. (in press). An investigation into the relationship among ADHD symptomatology, creativity, and neuropsychological functioning in children. *Child Neuropsychology.*

4.2 Introduction

Both creativity and Attention-Deficit/Hyperactivity Disorder (ADHD) are extensively studied topics in child psychology. There is much debate over how best to define each construct and in addition, some authors have argued that there are distinct similarities between the two (e.g., Cramond, 1994b; Leroux & Levitt-Perlman, 2000). These authors are concerned about the similarities and advocate for better ways to discriminate between the two, so that teaching can be adapted accordingly and development is not hindered by unnecessary medication of misdiagnosed children. They argue that the way one would treat a highly creative child should be very different from that of an ADHD child. With regard to the similarities in behavior, Dawson (1997) found that teachers rated the following traits as typical of a creative child: "makes up the rules as he or she goes along," "is impulsive," "is a nonconformist," and "is emotional." Similar teacher ratings such as "defies or refuses teachers' requests or rules," "impulsive or acts without thinking" and "stubborn, sullen, or irritable" have been used to describe children with ADHD (Skansgaard & Burns, 1998).

Very few studies have empirically investigated the relationship between ADHD and creativity. Cramond (1994a) found that in a sample of 76 creative adolescents, 26 percent of them met self-reported clinically elevated symptoms of ADHD. Thus the descriptions of the behavior of highly creative children, along with Cramond's (1994a) findings, suggest that ADHD and some creative children can display very similar behaviors. What is still unknown is whether different etiological factors are likely to lead to similar behaviors, or whether the same underlying mechanisms are responsible.

To date, the most prominent theory of ADHD suggests that self-regulation underlies the deficits seen in cognitive and behavioral functioning in ADHD (Barkley, 1997). This idea has been supported by research findings that children with ADHD have mild deficits in working memory and motor responses (Tannock, 1998), have difficulties inhibiting or delaying

behavioral responses (Nigg, 1999) and are much slower at processing simple information (Rucklidge & Tannock, 2002).

Unlike ADHD, the literature on the cognitive functioning of highly creative children is sparse with little consensus emerging, thus it is difficult to ascertain whether similar cognitive deficits may underlie the similar behaviors seen in ADHD and creative children. In relation to the cognitive functioning of creative individuals, Stavridou and Furnham (1996), and Green and Williams (1999), found that individuals with high divergent thinking ability had intact inhibition skills. Further, Gamble and Kellner (1968) and Golden (1975) found that creative individuals were less susceptible to interference than non-creative individuals, as measured by the Stroop task. On the other hand, Carson, Peterson and Higgins (2003) found that highly creative individuals had lower scores on a measure of latent inhibition, the ability to filter out both internal and external stimuli previously experienced as irrelevant. They argued that it is this inability to filter out information, in combination with high IQ, which makes these individuals constantly open to much more information, increasing the chances of them coming up with an original recombination of information. This idea has been expressed by a number of creativity theorists who argue that attention to a wide array of stimuli allows an individual to consider possibilities that they may miss if they had a more narrow focus (e.g., Eysenk, 1999; Wallach, 1970). Thus creative children may experience similar cognitive deficits to those found in children with ADHD.

Given the lack of empirical literature to date, the first aim for this study was to examine the prevalence of clinically elevated ratings of ADHD symptomatology in a creative population first via parent report rating scales and then second via a standardized clinical interview to more specifically describe the ADHD symptoms in the creative population. The second aim was to compare four groups on neurocognitive functioning: 1) children diagnosed with ADHD with normal levels of creativity, 2) creative children with ADHD symptoms, 3) creative children

without ADHD symptoms, and 4) a normal control group, in order to assess whether the presence of ADHD symptomatology in creative children affects their cognitive functioning in ways similar to those displayed by ADHD children. The hypotheses for the study were that a significant number of creative children will display symptoms of ADHD and that despite their creativity, these children will display similar cognitive deficits to children diagnosed with ADHD.

4.3 Method

Participants

Eighty-nine children aged between 10 and 12 years old took part in the study: 1) 29 (21 male, 8 female) were diagnosed with any of the three types of ADHD (predominantly inattentive, hyperactive and combined type) and had normal creativity scores on the Torrance Tests of Creative Thinking (TTCT – see below), 30 (14 male, 16 female) were identified as highly creative and divided into two subgroups with and without ADHD symptomatology (see below), and 30 (13 male, 17 female) normal controls with no indication of ADHD or creativity. Participants were predominantly Caucasian of varying S.E.S. backgrounds, residing in Christchurch, New Zealand. Recruitment was conducted through advertisements in local newspapers, gifted classes, school notices, and an ADD support group newsletter.

Inclusion criteria for the ADHD group: This group was established by confirming that all children had received a prior diagnosis of ADHD from either a psychiatrist or registered psychologist before entering the study, and that they had TTCT scores below the 90th percentile. This latter inclusion criterion was necessary in order to eliminate the possibly confounding effect of creativity on the neurocognitive functioning of the ADHD children. *T*-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the long versions of the parent form of the Conners' Rating Scales-Revised (CPRS-R; Conners,

1997 – see below) were used to confirm ADHD diagnosis. While data was collected on the teacher form of the Conners' (CTRS-R), this data was not used for classification purposes given that 26 of the ADHD children were on stimulant medications and therefore behavioral ratings in the classroom would likely underestimate ADHD symptoms. Further, recent work by Biederman, Faraone, Monateaux and Grossbard (2004) demonstrated that parents can be accurate reporters of ADHD symptoms and therefore it was deemed that these parent reports, along with a diagnosis from a clinician, was sufficient for inclusion in the ADHD group. Four children recruited for their ADHD diagnosis were excluded from the study due to their high TTCT scores (i.e. above 90th percentile).

In order to best explore the relationship between ADHD and creativity, two subgroups of the creative children were formed: a creative group with ADHD symptoms (CA) and a creative group without ADHD symptoms (CNA). *Inclusion criteria for the CA group:* Those children who scored in the 90th percentile or higher on the TTCT, and also had *T*-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of CPRS-R were included. A formal diagnosis of ADHD was not required for inclusion in this group as the aim of the study was to investigate those children exhibiting clinically elevated symptoms of ADHD in addition to being creative; excluding those not meeting full criteria would potentially eliminate those creative children driving the controversy between ADHD and creativity. *Inclusion criteria for the CNA group:* This group was established by confirming that each child scored in the 90th percentile, or higher, on the TTCT and had *T*-scores below 60 on the CPRS-R.

Inclusion criteria for the control group (NC): All the control children had *T*-scores below 60 on CPRS–R, and TTCT scores below the 90th percentile.

Exclusion criteria for all groups: Individuals with an estimated IQ score below 80, English as a second language, uncorrected problems in vision or hearing, serious medical

problems, or serious psychopathology were excluded. These criteria did not result in the exclusion of any participants.

Measures of ADHD symptomatology

Long versions of the parent (CPRS-R) and teacher (CTRS-R) forms of the Conners' Rating Scales-Revised (Conners, 1997) were used to measure ADHD symptomatology. The reliabilities across forms and raters are in the .85 to .95 range. Test-retest reliabilities at 6 to 8 weeks average .70 for the long version forms (Reitman, Hummel, Franz, & Gross, 1998).

As none of the creative children had been diagnosed with ADHD, the parents of all creative children who received *T*-scores above 65 (clinical cut off) on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the CPRS-R or CTRS-R, were interviewed by a doctorate level clinical psychologist using the behavioral section of the Schedule for Affective Disorders and Schizophrenia for school age children – Present and Lifetime Version (K-SADS-PL, Kaufman, Birmaher, Brent, Rao & Ryan, 1996), in order to further explore and describe the extent of ADHD symptomatology in the creative children. This interview generates DSM-IV diagnoses, and was used to determine whether or not these children met full criteria for a diagnosis of ADHD. The instrument has been validated with children aged 6 to 17 (Kaufman et. al., 1997). While this interview was not used for classification purposes, it was conducted in order to more accurately document the difficulties the creative children were having in the areas of attention, activity and impulsivity.

Measure of Creativity

Torrance Tests of Creative Thinking: Creative potential was measured using the TTCT, Figural Form A (Torrance, 1998) which is made up of three tasks, all of which involve coming up with unusual drawings that have standard shapes (e.g. a pair of straight lines) as a part of them. Each drawing is scored on 5 subscales: originality, fluency, elaboration, abstractness of titles, and resistance to premature closure. The final percentile

ranking is based on a combination of the scores for the 5 subscales as well as additional aspects like humour, emotional expressiveness, and richness of imagery. The inter-rater reliability of this measure is high, with correlations generally above .90 (Torrance, 1998). Torrance (1981) conducted a 22 year longitudinal study on the predictive validity of this measure, which compared scores from various forms of the TTCT with later life creative achievements. An overall creativity index score was devised based on participants' performance on the creativity tests. The creativity index was correlated with five indices of creative achievement and the product moment correlation coefficients were all significant at the 0.001 level. These indices included: number of high school creative achievements ($r = 0.38$), number of post high school creative achievements ($r = 0.46$), number of creative style of living achievements ($r = 0.47$), quality of highest creative achievements ($r = 0.58$), and quality of future career image ($r = 0.57$).

Measure of Socioeconomic Status

Socioeconomic status (SES) was determined using the New Zealand Socioeconomic Index of Occupational Status (NZSEI), an index which assigns New Zealand occupations with a socioeconomic score (Davis, McLeod, Ransom & Ongley, 1997). Scores range from 10 (low SES) to 90 (high SES).

Measure of Intelligence

Wechsler Intelligence Scale for Children: IQ was estimated using the Block Design and Vocabulary subtests of the WISC-III (Wechsler, 1991), which when combined are good indicators of Full Scale IQ (Sattler, 2002). The results of these subsets correlate highly with the full WISC III test, with $r = .862$ (Sattler, 2002).

Measure of Working Memory

Wechsler Intelligence Scale for Children: Working memory was measured using the Digit Span and Arithmetic subtests and the Freedom from Distractability index score of the WISC-III (Wechsler, 1991).

Measures of Processing and Naming Speed

Wechsler Intelligence Scale for Children: Processing speed was measured using the Coding and Symbol search subtests and the Processing Speed index score of the WISC-III (Wechsler, 1991).

Rapid Automatized Naming: Four tests of Rapid Automatized Naming (RAN) were selected: letter, number, colour, and object. RAN-Letters consists of 5 lower case letters repeated 10 times in random sequence, yielding 50 stimuli presented in 5 rows of 10 items on a chart. With an identical lay out to RAN-Letters, RAN-Numbers consists of 5 digits, RAN-Colours consists of 5 colour blocks, and RAN-Objects consists of 5 objects. Total time taken (in seconds) to name all stimulus items on each chart were the dependent variables. Number stated correctly, number of omissions, additions, deletions, and errors were also assessed as control variables. ADHD children have been found to be impaired on all of the tests chosen (see Rucklidge & Tannock, 2002).

Measures of Reaction Time and Inhibitory Control

Stop Task: The Stop task tracking version (Williams, Ponesse, Schacher, Logan, & Tannock, 1999), a variant of the stop-signal paradigm (Logan, 1994), was used to measure reaction time and the degree of voluntary inhibitory control that participants can exert over response processes. The paradigm involves two concurrent tasks, a 'go' task and a 'stop' task. The go-task is a choice reaction time task that requires the individual to discriminate between X and O by pressing the associated buttons on a separate response box. The stop-task (which occurs on 25% of the go-task trials) involves the presentation of a tone that informs the

individual to stop (inhibit) his/her response to the go-task for that trial. Dependent measures are the latency and variability of responses to the go-task and estimated stop-signal reaction time.

Stroop Task: Inhibitory control and naming speed were tested using the Stroop Task (Golden, 1978). There are three parts to the test: the first involves participants reading randomised colour names (blue, green, red, yellow) printed in black type, the second part involves participants naming the colour of the printed crosses, and the third part involves participants reading the colour names printed in coloured ink of a different colour to the colour-word. Number of items identified correctly are recorded in order to determine the amount of interference encountered. Test-retest reliability was calculated using a one-month interval between test sessions, and reliability estimates of .90, .91, and .83 were found for the three parts of the test (Spreen & Strauss, 1991).

Stroop Negative Priming Task: Reaction time, number of errors, and negative priming were measured using this variant of the Stroop task (Pritchard & Neuman, 2004). This task involved reading out 16 cards which had 11 colour words printed in incongruent colours, on each card. Each word and each ink colour appeared only once on a given card. Test cards consisted of six Unrelated (UR) trials (where neither the hue nor distractor colour-word in a stimulus were repeated in the subsequent stimulus) and six Ignored Repetition (IR) trials (where the distractor word in a previous display repeated as the subsequent target hue) cards. Four additional UR cards were used for practice trials. The first two items on each IR card were unrelated in order to reduce the saliency of this condition. Time to read each card and number of errors was recorded.

Measures of executive functioning

Tower of London: Problem representation, planning, execution and evaluation were tested using the Tower of London task (TOL, Shallice, 1982). This task involves following certain rules to accomplish the goal of moving a set of blocks from one position to another.

Points are gained for correct solutions to the puzzle and time taken to make the first move is recorded as an indicator of time spent planning the exercise. Overall, this task appears to be a developmentally sensitive and neuropsychologically valid planning measure (Lyon, 1994). Only on very young children is a satisfactory test-retest reliability of 0.71 explicitly reported (Gnys & Willis, 1991).

Maier's two-string problem: Insight and abstractness of thinking were tested using Maier's two-string problem (Maier, 1931) which has been characterised as being high in novelty and having considerable ecological validity in being close to real life problems (Kaufman, 1979). For this task, two pieces of string were hung from the ceiling on either side of a room. The strings were not long enough to be able to hold one and reach to grab the other. The children were given a number of tools that they could use to help tie the strings together and were asked to think of as many different ways as they could to use the tools to tie the strings. The number of ideas (i.e. different ways to tie the strings together) was recorded as one measure. The particular idea of using one of the tools, a spanner, as a pendulum in order to tie the two strings together was scored as a separate measure, as use of this tool indicated a high level of abstract thinking ability.

Procedure.

Each child was tested individually for two and a half hours. Ethics approval for the study was gained from the local Human Ethics Committee. Participation was voluntary and included parental and child consent. Ninety percent (n=26) of the children diagnosed with ADHD were taking the short-acting form of methylphenidate as medication for the disorder. They were asked not to take their medication 24 hours prior to the day of testing as stimulant medications are known to effect cognitive functioning (Berman, Douglas & Barr, 1999). On the day of testing, it was confirmed with parents that the child had not been given their ADHD medication. As methylphenidate has an approximate half-life of 4.5 hours (Shader, Harmatz,

Oesterheld, Parmelee, Sallee, & Greenblatt, 1999), a 24 hour elimination period should have ensured that the majority of the active ingredient had been eliminated prior to testing. Parents and teachers were asked to fill in the CRS-R.

Statistical Analyses

Results were analysed using the Statistical Package for the Social Sciences- windows version 11.5. Univariate analyses of variance were used to examine group difference and if the overall Wilk's Lambda was significant ($p < 0.05$); specific group differences were examined with post-hoc Tukey tests using a p value of .05. Cohen's d effect size (ES) calculations were used to further determine the magnitude of the difference between the creative and ADHD groups.

4.4 Results

Sample characteristics.

There were no group differences on age; however, there were group differences on SES, IQ, TTCT, and ADHD symptomatology (see Table 1). For SES, $F(3.88) = 13.02, p < 0.001$, the CA, CNA and NC groups' parents had higher ratings than ADHD group's parents. The estimated FSIQ scores of the CA and CNA groups were higher than those of the NC group, who in turn had higher IQ scores than the ADHD group, $F(3,88) = 11.83, p < 0.001$. Further, the correlation between IQ and creativity was examined and a significant positive relationship was found, $r = 0.47, p < 0.01$.

Not unexpectedly, the TTCT scores of the CA and CNA groups were higher than those of the ADHD and NC groups. There were no differences in the creative ability of the ADHD and NC groups, $F(3,88) = 39.04, p < 0.001$.

In relation to ADHD symptoms, 12 (40%) of the 30 creative children (9 male, 3 female) were rated by their parents as displaying significant levels of ADHD symptomatology (i.e. *T*-

scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales). Teacher ratings of their ADHD symptomatology, on the other hand, were not in the significant range. These lower teacher ratings could be due to the unique school environments (small classes, enriched and stimulating environments) many of the creative children were being taught in (Bussing, Gray, Leon, Wilson Garvan, & Reid, 2002). Overall, there was a large effect-size (by Cohen's convention) between both parent and teacher ratings of the CA and CNA groups (see Table 1). These 12 children were placed in the CA group and the other 18 placed in the CNA group.

The K-SADS-PL interview determined that 11 of the CA children had mainly inattentive symptoms and one had symptoms of both impulsivity/hyperactivity and inattention. On average, they displayed 3.5 of the nine inattentive symptoms (SD = 1.51) and 0.67 of the nine hyperactive/impulsive (SD = 1.23) symptoms of ADHD. None of the children met full criteria for a diagnosis of ADHD as they were not meeting the criteria of having six of the nine symptoms of ADHD. Further, even with those symptoms the children displayed, many parents indicated that the symptoms were not impairing them across multiple settings. On the Inattentive subscale of the CPRS-R, the CA group had higher scores than the CNA and NC groups, F (3,88) = 116.68, $p < 0.001$. On the Hyperactive, F (3,88) = 132.11, $p < 0.001$ and DSM IV-total, F (3,88) = 227.483, $p < 0.001$, subscales the ADHD group scored higher than the CA group who in turn scored higher than the CNA and NC group. For the CTRS-R, the ADHD and CA groups did not differ, and scored higher than the CNA and NC groups on the Inattentive subscale, F (3,88) = 12.91, $p < 0.001$. The ADHD group scored higher than the other three groups on the Hyperactive subscale, F (3,88) = 10.01, $p < 0.001$, and on the DSM-IV total subscale, F (3,88) = 13.29, $p <$ 0.001 the ADHD group scored higher than the CNA and NC groups (see Table 1).

Table 1

Sample characteristics: means and standard deviations

	ADHD (n=29)		*CA (n=12)*		*CNA (n=18)*		*NC (n=30)*		Wilk's Lambda	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F(3,88)	Contrasts[a]
Age	11.44	0.85	11.10	0.94	11.10	0.80	11.10	0.89	1.018	
SES	48.64	12.99	66.33	15.20	70.58	8.58	61.25	9.95	13.017***	ADHD<CA,CNA,NC
WISC III Scaled Scores (SS)										
Estimated FSIQ	106.03	15.53	127.50	13.60	127.78	11.91	117.10	13.53	11.843***	ADHD<NC<CA,CNA
TTCT (Percentiles)	37.83	30.48	94.58	3.23	94.89	3.85	45.97	23.37	39.036***	ADHD,NC<CA,CNA
CPRS-R (T-scores)										
Inattentive	75.43	8.53	70.75	3.41	47.18	5.46	47.32	5.56	116.679***	ADHD,CA>CNA,NC
Hyperactive	82.07	8.29	63.75	8.64	48.29	6.07	47.80	4.93	132.114***	ADHD>CA>CNA,NC
DSM-IV total	81.07	6.19	67.58	2.81	47.47	5.68	47.32	4.97	227.483***	ADHD>CA>CNA,NC
CTRS-R (T-scores)										
Inattentive	57.10	10.18	53.08	10.00	45.28	3.14	45.23	3.89	12.910***	ADHD,CA>CNA,NC
Hyperactive	57.25	13.56	48.00	5.01	46.33	5.12	44.27	3.78	10.007***	ADHD>CA,CNA,NC
DSM-IV total	57.95	12.46	51.00	7.65	45.17	3.99	44.32	3.11	13.286***	ADHD>CNA,NC

Note: [a]Tukey's HSD, $p < .05$, CA = creative with ADHD symptomatology, CNA = creative without ADHD symptomatology, NC = normal control, CPRS-R = Conners' Parent Rating Scale-Revised, CTRS-R = Conners' Teacher Rating Scale-Revised, TTCT = Torrance Tests of Creative Thinking, *** $p < 0.001$.

Covariates

All of the univariate analyses reported in this study were rerun separately controlling for Estimated Full Scale IQ and SES as both of these dependent variables were significantly different across groups. Full Scale IQ was not used as a covariate for WISC III data. All but one of the significant group differences remained statistically significant after controlling for both IQ and SES. Only TOL points for correct solution became non- significant after controlling for IQ. No non-significant results became significant.

Measures of Working Memory

The ADHD group scored lower than all of the other groups on the Arithmetic subtest of the WISC III, F (3,88) = 9.88, $p < 0.001$. For WISC III Digit Span, F (3,88) = 6.97, $p < 0.001$, Raw Digit Forward, F (3,88) = 2.87, $p < 0.05$, and Raw Digit Backward, F (3,88) = 4.36, $p < 0.01$, the ADHD group scored lower than the CNA group. For Digit Span, the CNA group had higher scores than the NC group. For the Freedom from Distractibility index score of the WISC III, the ADHD group scored lower than all of the other three groups, and the CNA group had higher scores than the NC group, F (3,88) = 12.72, $p < 0.001$ (see Table 2).

Measures of Processing and Naming Speed

The ADHD group scored lower than all the other groups on the Processing Speed subscale, F (3,88) = 11.06, $p < 0.001$, and Symbol Search subtest, F (3,88) = 5.78, $p < 0.01$, of the WISC-III. For Coding, F (3,88) = 5.78, $p < 0.001$, they scored less than the CNA and NC groups. The CA group had lower scores than the CNA group on Coding (see Table 2).

On the RAN, the ADHD group were slower than the CNA and NC groups at reading out the cards for RAN-Letters (F (3,88) = 4.73, $p< 0.01$), Colours (F (3,88) = 7.21, $p< 0.001$), and Objects (F (3,88) = 4.92, $p < 0.001$), and for RAN-Numbers (F (3,88) = 4.88, $p < 0.01$) they were slower than the CNA group (see Table 2). ANOVAs were also conducted to see if there were any group differences on RAN number of omissions, additions, and deletions. No

differences were found, suggesting that the slower responses in ADHD and CA were due to slower retrieval rather than mediated by inaccurate retrieval. Indeed the number of errors across the four tasks was less then one error for all groups which is to be expected given the simplicity of the task.

Measures of Reaction Time and Inhibitory Control

For the Stop task, the ADHD group showed more variability in their go-reaction times than all three other groups, $F(3,88) = 5.93, p < 0.001$. They had slower stop-signal-go reaction times, $F(3,88) = 5.93, p < 0.001$, and made more errors, $F(3,88) = 5.07, p < 0.01$, than both the CNA and NC groups. There were no group differences for Stop go-reaction-time, $F(3,88) = 0.84$, *ns* (see Table 2).

The ADHD group were also slower than the CNA and NC groups at reading out the cards for Stroop-Word ($F(3,88) = 9.89, p < 0.001$), Colour ($F(3,88) = 8.44, p < 0.001$), and Colourword ($F(3,88) = 7.61, p < 0.001$). There were no group differences for Stroop interference ($F(3,88) = 1.03$, *ns* (see Table 2).

For the Stroop Negative Priming Task, a two-way mixed analysis of variance (ANOVA) was carried out on the mean reaction times. The between-subjects factor was group (ADHD versus CA versus CNA versus NC) and the within-subjects factor was priming condition (Unrelated versus Ignored Repetition). The between-subjects factor of group was significant, $F(3, 86) = 8.34, p < .001$. In order to determine whether there were differences in the overall reaction times between the groups, Newman-Keuls post-hoc analyses were conducted. The results indicated that the ADHD group responded significantly more slowly than both the CNA and control groups, (p's < .01), but there was no difference between the ADHD and CA groups, and between both of the creative groups and the control group. The within-subjects factor of priming condition (Unrelated versus Ignored Repetition) was significant, $F(1,86) = 6.53, p < .01$, and there was no interaction, $F < 1$. Thus, all participants responded slower on the Ignored

Repetition trials than on the Unrelated trials, showing that the NP effect was similar across the three groups and was unrelated to overall processing speed. Similar analyses were conducted for error scores. The between-subjects factor of group type was significant, $F(3,86) = 6.03, p < .001$. Newman-Keuls analyses indicated that the ADHD group made significantly more errors than the other three groups ($ps < .01$). No other error effects were significant. This shows that all of the groups produced numerically more errors in the Ignored Repetition than the Unrelated condition, therefore there is no indication of speed-accuracy trade-offs that could compromise the reaction time analyses.

Measures of Executive Functioning

For the TOL, the ADHD group came up with fewer correct solutions to the puzzle than both the CA and CNA groups, $F(3,88) = 3.70, p < 0.05$. They also made their first move significantly faster than the CNA and NC groups showing that they were not taking as much time to plan their moves, $F(3,88) = 5.35, p < 0.01$. Performance on the TOL was the only measure where the CA and CNA groups had similar scores and were clearly out performing the ADHD group (see Table 2).

For Maier's two-string problem, the ADHD group came up with fewer ideas than both the CA and CNA groups; and the NC group came up with fewer ideas than the CNA group, $F(3,88) = 9.58, p < 0.001$. A chi square test was used to determine whether there were group differences in the number of children who thought to use the wrench as a pendulum in order to tie the pieces of string together, for Maier's two-string problem. A significant difference was found, $\chi^2(3, 89) = 24.858, p < .001$. Twenty four percent ($n = 7$) of the ADHD group, 83% ($n = 10$) of the CA group, 61% ($n = 11$) of the CNA group, and 20% ($n = 6$) of the NC group thought to use the pendulum.

Table 2

Neurocognitive functioning by group: means and standard deviations

	ADHD (n=29)		*CA (n =12)*		*CNA (n=18)*		*NC (n=30)*		Wilk's Lambda		Effect Sizes *(d)*	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F(3,88)	Contrasts[a]	ADHD &CA	CA& CNA
Working Memory												
WISC III (SS)												
Digit Span	8.59	2.47	11.42	4.12	11.94	2.10	9.87	2.47	6.967***	ADHD<CA, CNA NC<CNA	0.83	0.16
Raw Digits Forward	8.28	1.53	9.17	2.04	9.56	1.50	8.47	1.59	2.868*	ADHD<CNA	0.49	0.22
Raw Digits Backward	4.38	1.50	5.75	2.26	6.11	1.57	5.30	1.75	4.361**	ADHD<CNA	0.71	0.19
Arithmetic	8.66	3.29	13.67	2.64	13.28	4.03	11.40	3.32	9.882***	ADHD<CA, CNA, NC	1.68	0.11
Freedom from Distractibility	92.69	14.21	113.33	14.78	116.67	14.91	104.57	13.38	12.715***	ADHD<CA, CNA, NC NC<CNA	1.42	0.22
Processing and Naming Speed												
WISC III (SS)												
Coding	8.92	2.96	10.92	2.47	13.56	2.41	12.07	2.89	13.043***	ADHD<CNA, NC CA<CNA	0.73	1.08
Symbol Search	10.17	1.50	12.75	2.45	13.67	3.24	12.30	2.73	5.781**	ADHD<CNA	1.27	0.32

Processing Speed	98.21	14.78	110.67	10.55	119.67	12.19	112.20	13.01	11.056***	ADHD<CA, CNA, NC	0.97	0.79
RAN (sec)												
Numbers	27.58	8.61	25.26	6.05	20.54	3.50	23.42	5.32	4.878**	ADHD>CNA	0.31	0.96
Letters	26.97	7.71	24.60	4.71	21.00	4.83	22.89	4.09	4.733**	ADHD>CNA,NC	0.37	0.75
Colours	46.54	12.51	41.63	8.23	34.17	7.78	38.03	7.80	7.212***	ADHD>CNA,NC	0.46	0.93
Objects	45.27	8.41	45.43	9.04	38.87	6.77	39.50	6.41	4.922**	ADHD>CNA,NC	0.01	0.82
Reaction Time and Inhibitory Control												
Stroop Task (T-scores)												
Word	42.65	7.37	46.75	5.66	52.11	5.80	50.17	6.51	9.886***	ADHD<CNA,NC	0.62	0.94
Colour	40.93	8.21	44.00	6.47	51.89	8.72	48.77	8.04	8.443***	ADHD<CNA,NC CA<CNA	0.42	1.03
Colour-Word	47.48	11.48	51.00	10.29	59.50	8.07	56.57	7.64	7.609***	ADHD<CNA,NC	0.32	0.92
Interference	54.41	8.26	56.92	4.78	57.17	4.29	56.67	5.40	1.028		0.37	0.06
Stop Task												
Go reaction time (msec)	706.75	185.78	634.13	127.42	698.58	65.30	704.80	134.42	0.839		0.46	0.64
SD go reaction time	264.64	123.54	193.08	47.70	177.94	42.89	191.76	52.36	5.926***	ADHD>CA,CNA,NC	0.76	0.33
Stop-signal-go reaction time (msec)												

	347.25	211.00	263.15	87.42	190.72	47.76	226.50	93.39	5.934***	ADHD>CNA,NC	0.52	1.03
Percent correct	95.29	4.42	96.74	2.82	98.61	1.84	97.80	2.29	5.068**	ADHD<CNA,NC	0.39	0.79
Executive Functioning												
TOL												
Points for solutions	21.21	7.03	27.50	5.16	26.56	6.94	24.13	6.59	3.696*	ADHD<CA,CNA	1.02	0.14
Time to make first move (sec)												
	1.72	1.74	3.94	2.44	6.11	4.77	5.82	6.34	5.351**	ADHD>CNA,NC	1.05	0.57
Maier's two string problem (# ideas)	4.79	2.16	6.58	1.88	7.89	3.45	4.9	1.15	9.578***	ADHD<CA,CNA NC<CNA	0.88	0.47

Note: [a]Tukey's HSD, $p<0.05$, CA = creative with ADHD symptomatology, CNA = creative without ADHD symptomatology, NC = normal control, TOL = Tower of London, $^{**}p < .01$, $^{***}p < .001$

Effect Size Calculations

Overall, effect size calculations for all neurocognitive functioning measures showed small to medium differences between the CA and ADHD groups and medium to large differences between the CA and CNA groups. By looking at the means and effect sizes of the ADHD, CA and CNA groups, it is clear that the CA group consistently had scores that fell in between the ADHD and CNA groups; suggesting that this group is having more difficulty than the CNA group, but not as much difficulty as the ADHD group (see Table 2).

Exploratory Correlations

Given that the effect size calculations suggest that the CA group may differ from the CNA group on a number of the cognitive measures, correlations were conducted to specifically determine the strength of the relationship between ADHD symptomatology and cognitive functioning, within the creative sample. Since the CA group mostly displayed symptoms of inattention, parent's ratings on the Inattentive subscale of CRS-R were used. Strong negative correlations were found between inattention and WISC III Processing Speed ($r = -0.364, p < 0.05$) and Coding ($r = -0.363, p < 0.05$); T-scores for Stroop Word ($r = -0.302, p < 0.05$), Colour ($r = -0.441, p < 0.05$), and Colour-Word ($r = -0.382, p < 0.05$); STOP percent correct ($r = -0.425, p < 0.05$), and go reaction time ($r = -0.387, p < 0.05$). There was a strong positive correlation between inattention and reaction times on RAN numbers ($r = 0.356, p < 0.05$), letters ($r = 0.297, p < 0.05$), colours ($r = 0.373, p < 0.05$), and objects ($r = 0.311, p < 0.05$); and stop-signal-go reaction time ($r = 0.488, p < 0.01$). No relationship was found between inattention and WISC III Freedom from Distractibility, Arithmetic, Digit Span, Symbol Search, STOP standard deviation of go-reaction-time, TOL points for correct solutions, TOL time to make first move and

number of ideas on Maier's two string problem. Overall, these results show that slower reaction times are closely related to the inattention symptom of ADHD in this creative group; and that creative children perform equally as well on most IQ and executive functioning measures, regardless of severity of ADHD symptomatology.

4.5 Discussion

Results of this study showed that, in accordance with Cramond's (1994a) findings, a high percentage (40%) of creative children displayed significant levels of ADHD symptomatology that were within a clinical range on standardized scales of ADHD. This percentage is significantly higher than one would expect in the normal population. Given the cutoff used to identify children with ADHD symptomatology was 1.5 SD above the mean, one would expect approximately 9% of children within the general population to display clinically elevated levels of ADHD symptomatology. That this current study found a rate over four times expected suggests that ADHD symptomatology in a creative population is a relatively common occurrence.

This study went on to establish, via a standardised interview, that the creative children with elevated Conners scores did not meet full criteria for ADHD. For the most part, although parents endorsed symptoms of ADHD, they generally did not believe that their children were significantly impaired by them. Further, the teacher ratings were within normal limits, suggesting that these children were not experiencing any difficulties at school that were of concern to teachers. High levels of inattention in creative children are not surprising given the number of past researchers and theorists arguing that inattention is a necessary feature of creativity (e.g., Carson et. al., 2003; Eysenck, 1999, Simonton, 2003) and Carson et. al.'s (2003) work on latent inhibition and creativity. This study implicates

that while ADHD symptoms are common in the creative population, a full diagnosis of ADHD is not.

This study is the first to then take these two types of creative children (with and without ADHD symptoms) and compare them, on measures of neurocognitive functioning, with ADHD children with normal creativity. On measures of Full Scale IQ, working memory and executive functioning, the creative group with ADHD symptoms performed significantly better than the ADHD group and very similarly to the creative group without ADHD symptoms. Alternatively, on measures of processing speed, reaction time and naming speed, the creative group with ADHD symptoms consistently performed in between the ADHD and creative group without ADHD symptoms, suggesting that this group of children is somewhat impaired on these cognitive processes. Consistent with these results, correlational analyses confirmed that as creative children's inattention increased, their reaction times decreased and their naming speeds increased. However, the presence of inattention did not appear to be related to deficits in overall IQ measures or executive functioning, suggesting that inattentive creative children process information slower and react slower to stimuli but that these deficits do not appear to impair more general cognitive abilities.

As 40% of the creative children recruited for the study displayed symptoms of ADHD, one needs to ask why it is that so many creative children display significant levels of ADHD symptomatology? This question remains unanswered in the literature to date, but a possible explanation may come from Carson et. al.'s (2003) work on latent inhibition and creativity. These authors found that actual lifetime creative achievers had significantly more difficulty filtering out possibly irrelevant information than controls, and suggested that this deficit, in combination with high IQ, was

actually aiding their creativity. Therefore, it may be that the neurocognitive deficits found in the creative children with ADHD symptoms occur due to the fact that their inability to filter stimuli is slowing them down. What possibly distinguishes the creative children from ADHD children is that due to their high IQ, they are able to process the vast array of information that they receive and incorporate it into their ideas; whereas ADHD children may not be able to effectively process and incorporate the information they receive.

One difficulty with Carson et al's (2003) theory is that they suggest that high IQ is a necessary component for creativity and although it has been posited by the threshold theory that creativity and IQ are correlated up until an IQ of 120 (e.g. Albert & Elliot, 1973; Barron, 1969), empirical investigations of this theory have resulted in contradictory and inconclusive results. It appears that results differ depending on the measures of both creativity and IQ/achievement that are used (Runco & Albert, 1986). For example, a study by Marcelino (2001) showed that IQ (as measured by the WISC) and Torrance Test of Creativity scores were not significantly correlated; where as Guilford and Christensen (1973) used Lorge-Thorndike IQ scores and five divergent thinking tests and found that "the higher the IQ, the more likely we are to find at least some individuals with high creative potential" (p. 251). Further, it has been stated in the literature that one can be creative without having high IQ, and be highly intelligent without being creative (Sternberg, 1999). Thus, it is important to differentiate creativity from IQ and investigate it as a separate domain. Indeed, a number of the children (17%) in this study had an estimated IQ in the average range (i.e. less than 1SD above the mean) and yet showed high creativity scores, highlighting that while they are highly correlated constructs, high IQ is not a necessary condition for high creativity.

A further question in relation to creativity is that, if deficits in latent inhibition are linked to creativity, then why it is that only 40% of the children in the creative group displayed these "ADHD-like" behaviors? It may be due to the fact that the Torrance Tests of Creative Thinking is a measure of creative *potential* rather than a measure of *actual* creative achievement. It is possible that those children with high IQ and creative potential, who are also open to more stimuli due to their latent inhibition deficits, will be the ones who will become true creators. Furthermore, it may be the use of participants who score highly on measures of creative potential rather than ones who are actual creators, which has lead to the confusion and contrary results in the literature on cognitive functioning and creativity to date. Future research in this area should focus more on populations of actual life time achievers.

The finding that both ADHD and creative children with symptoms of ADHD had difficulties in naming speed and reaction times, supports Barkley's (1997) theory that deficient cognitive functioning is, at least in part, related to the behavioral manifestations of ADHD. Furthermore, when comparing the ADHD and creative group with ADHD symptoms, it appears that as cognitive functioning deficits increase so does the severity of the ADHD symptomatology (as reported on the CPRS-R). This study is the first to document the presence of these difficulties in a creative sample.

However, our results suggest that it may not be poor executive functioning in general (such as working memory, planning, and problem solving) that is the driving mechanism behind the behaviors seen in ADHD, but rather processing speed and reaction times in particular. The ADHD group was no different from controls on a number of executive functioning measures including working memory (Digit Span, Symbol Search), inhibition (Stroop Interference, Stroop negative priming), planning and problem solving (TOL, and Maier's two-string problem), yet on measures of reaction time and naming

speed (Processing Speed; RAN numbers, letters, colours, and objects; Stroop word and colour; Stroop negative priming; stop-signal-go reaction time; TOH time to make first move), the ADHD group were found to be significantly more impaired than controls. These findings add to the growing literature linking colour naming deficits, overall slow reaction times and processing speed deficits with ADHD (e.g., Nigg, Hinshaw, Carte & Treuting, 1998; Rucklidge & Tannock, 2002). These findings also replicate past studies which found no differences between ADHD and controls on Stroop interference (e.g., Nigg, Blaskey, Huang-Pollock & Rappley, 2002), and TOL in ADHD predominantly inattentive type (Klorman, et. al, 1999; Nigg et. al., 2002).

Limitations

There are a number of limitations that hinder the generalizability of these results. First, because the creative groups were formed experimentally and not directly recruited for ADHD symptomatology, the sample sizes of both of the creative groups were small, impacting on power. Second, we did not assess the ADHD group with a standardised interview; instead the diagnosis came from community practitioners and was then confirmed with rating scales, which inevitably produces some variability into the diagnostic procedures. As such, inter-diagnostician reliability could not be assessed. Third, the ADHD sample consisted of all three subtypes types of ADHD (i.e. predominantly inattentive, predominantly hyperactive and combined type), yet the sample size was too small to allow analyses between subtypes. Fourth, while it is hard to know what influence IQ had on the results, an attempt to control for IQ did not have a significant effect on the pattern of results. Fifth, only one measure of creativity was used to ascertain whether or not children where highly creative. Finally, the groups had unequal numbers of male and female participants with too few girls in the ADHD and creative group with ADHD symptoms to determine whether there were differences in functioning based on gender.

Clinical Implications

There is a concern in the literature that creative children will be misdiagnosed with ADHD. This study does not support this concern. Indeed, despite the fact that a large percentage of the children recruited for high creative ability showed significant elevations on ratings of ADHD symptoms, *none* of them met full criteria for a diagnosis of ADHD, showing that these symptoms are not proving to be problematic in their environments, and are not raising concerns for parents or teachers. Further, none of them entered the study with a diagnosis of ADHD suggesting that the symptoms were not significant enough to warrant referral. Thus, concerns of misdiagnosis appear unwarranted. The assumption behind the concern about misdiagnosis appears to be that the underlying mechanisms leading to these behaviors are different and thus creative children would not benefit from the standard treatment offered to children with ADHD (Cramond, 1994b). The results of this study suggest that the underlying mechanisms may indeed be the same and that these creative children do have difficulties on some of the same tasks as ADHD children, although they appear less severe. Therefore, one cannot conclude that these children would not benefit from similar treatment approaches. Instead, it may be that the creative children displaying ADHD symptoms have a vulnerability that, to date, has not been stressed. Further, it may be that these children's environment is more suited to their needs and enables them to benefit from their inattention and develop their creativity. Only further investigations of treatment approaches for creative children impaired by ADHD symptoms would clarify the best practice parameters for these children.

CHAPTER 5

STUDY 3: AN INVESTIGATION INTO THE PSYCHOSOCIAL FUNCTIONING OF CREATIVE CHILDREN: THE IMPACT OF ADHD SYMPTOMATOLOGY[1].

5.1 Abstract

This study examined the relationship among creativity, ADHD symptomatology, temperament, and psychosocial functioning by comparing four groups of children aged 10-12 years: (1) 29 ADHD children without creativity, (2) 16 highly creative children displaying ADHD symptomatology, (3) 18 highly creative children without ADHD symptomatology, and (4) 30 normal controls. Children completed the TTCT, Child Depression Inventory, Revised Child Manifest Anxiety Scale, and Rosenberg Self-Esteem Scale. Parents completed the Junior Temperament and Character Inventory, Family Environment Scale, and the parent version of the Kastan Children's Attributional Style Questionnaire. Parents completed the Conner's Rating Scales and Child Behavior Checklist, and teachers completed the Child Behaviour Checklist. Results showed that the presence of ADHD symptomatology in creative children was related to their temperamental characteristics, and parent reports of children's levels of anxiety and depression. However, family environment and mother's attributions did not appear to be related to the presence of ADHD symptomatology in creative children. These findings have implications for the development and management of creative children.

[1]**Published paper:** Healey, D., & Rucklidge, J.J. (in press). An investigation into the psychosocial functioning of creative children: The impact of ADHD symptomatology *Journal of Creative Behaviour*.

5.2 Introduction

Both creativity and Attention Deficit Hyperactivity Disorder (ADHD) are extensively studied topics in child psychology. Some authors have argued that there are distinct similarities between children who are diagnosed with ADHD and those who are creative (e.g., Cramond, 1994; Leroux & Levitt-Perlman, 2000). A small number of studies have looked at the creative ability of children with ADHD (Shaw & Brown, 1991; Cramond, 1994; Sang, Yu, Zhangming, & Yu, 2002; Alt, 1999). However, to our knowledge only one study has empirically investigated the presence of ADHD symptomatology in the creative population. This study, conducted by Cramond (1994a), showed that, according to their self reports on the Swanson, Nolan, and Pelham Checklist (SNAP), 26 % of the creative adolescents that she tested met criteria for a diagnosis of ADHD.

In reviewing current theories of creative behavior, it is not surprising that a large number of highly creative children display ADHD symptomatology. Carson, Peterson and Higgins (2003) found that highly creative individuals had lower scores on a measure of latent inhibition (which is the ability to filter out both internal and external stimuli previously experienced as irrelevant) than controls. This description is similar to that of two of the symptoms of ADHD described in DSM–IV-TR, "often has difficulty sustaining attention in tasks or play activities" and "is often easily distracted by extraneous stimuli" (American Psychiatric Association, 2000). Carson et al. (2003) argued that this inability to filter out information (in combination with high IQ) makes these individuals constantly open to much more information, increasing the chances of them coming up with an original recombination of information. A similar idea has been expressed by a number of creativity theorists who argue that attention to a wide array of stimuli, or defocused attention, allows an individual to consider possibilities that they may miss if they had a more narrow focus

(e.g. Eysenk, 1999; Gardener, 1982). Therefore inattention and distractibility would be expected to be present in the creative population.

Although Cramond (1994a) reported on the prevalence of ADHD symptomatology in creative individuals, she did not investigate the impact that these symptoms have on the general functioning of the adolescents. To date, the only research findings are that a large proportion of creative children appear to display symptoms of ADHD. There has been no research on the possible role of temperament and family environment in the development of these symptoms, nor on the impact of ADHD symptomatology on the psychosocial functioning of creative children. Therefore, this study aims to compare the psychosocial functioning of ADHD and creative children. The areas of psychosocial functioning that children with ADHD have been shown to have the most difficulty with are higher depression and anxiety (Biederman, Faraone, Monuteaux, Bober, & Cadogen, 2004), lower self esteem (Topolski, Edwards, Patrick, Varley, Way, & Buesching, 2004), deficient social skills (Barkley, 1998; Tannock, 1998, Wolfle & French, 1990), negative perceptions from others (Werry, Reeves & Elkind, 1987), dysfunctional family environments (Halloran, Ross & Carey, 2002) and difficult temperament (Werry et. al., 1987), and thus these aspects will be measured and compared in this study.

Currently, the research that has been done on the family and psychosocial functioning of creative children is difficult to interpret. Although some researchers have reported that creative individuals experience low mood (Hershman & Lieb, 1998; Papworth & James, 2003), others have found that there was no correlation between creativity and current depressive state (Sitton & Hughes, 1995). Similarly, some authors have reported that anxiety is higher in creative children than in controls (Carlsson, 2002; Carlsson, Wendt, & Risberg, 2000), while others have reported that it is lower (Asthana, 1993; Matejik, Kovac, & Kondas, 1988). Again, there are

researchers who have reported a relationship between high self-esteem and creativity (Kemple, David, & Wang, 1996; Goldsmith & Matherly, 1988), and those who found no evidence that creative individuals have higher self-esteem than less creative individuals (Williams, Poole, & Lett, 1977). Highly creative children have been reported to have difficulty with, or little interest in, establishing warm interpersonal relationships (Ochse, 1990). In contrast, several studies have shown that creative children are seen as the most popular in a group (Aranha, 1997; Lau & Li, 1996). Further, Smith and Moran (1990) found that highly creative children were not less sociable, less cooperative, or more defiant and rebellious than their less creative peers.

Temperamentally, creativity has repeatedly been linked to the personality characteristic of "openness to experience" (King, McKee Walker, & Broyles, 1996; McCrae, 1987). Creative individuals have also been described as "sensation seeking" (Barron, 1998; Farley, 1985), moderately non-conforming, autonomous, and rebellious (Runco & Sakamoto, 1996). In relation to how others perceive creative children, Dawson's (1996) work showed that teachers valued traits such as being considerate of others, being obedient, being popular with peers, and being willing to accept judgements of authorities; all of which are not highly correlated with creativity. Similarly, some past research has shown that parents do not perceive the personality characteristics of their creative children favourably (Singh, 1987; Paguio, 1982; Raina, Kumar & Raina, 1980), yet others have found the opposite (Albert & Runco, 1989; Runco, Johnson, & Bear, 1992).

In relation to family environment, creative children have been described as growing up in an environment that stresses independence, is less child-centred, has tense family relationships and experiences more negative affect than do non-creative, high achieving children (Olszewski, Kulieke, & Buescher, 1987). On the other hand, creative children

have been described as having families that are better educated, more open to experiences, and have higher educational aspirations for their children, than those of non-creative children (Jausevek, 1981).

It is possible that one factor that is contributing to these varying results in the literature across different psychosocial domains is the severity of ADHD symptomatology present in the creative populations studied. Indeed, some studies are showing similar psychosocial problems in creative children as have been evidenced in the ADHD population, however direct comparisons between ADHD and creative groups have never been made. The current study proposes that the conflicting literature on the psychosocial and family functioning, and the temperament of highly creative children may be due to the presence of two subtypes of creative children: (1) those who display symptoms of ADHD and therefore experience similar functioning difficulties as children diagnosed with ADHD, and (2) those who do not display ADHD symptomatology and therefore do not experience difficulties. Thus, the hypothesis for this study is that creative children displaying ADHD symptomatology will experience similar psychosocial difficulties to those of children diagnosed with ADHD, and will have significantly more difficulties than those creative children who do not display ADHD symptomatology.

5.3 Method

Participants

Ninety three children aged between 10 to 12 years old took part in the research: 1) 29 (21 male, 8 female) ADHD children with normal creativity scores, 2) 16 children (11 male, 5 female) displaying ADHD symptomatology and high creativity scores, 3) 18 (5 male, 13 female) highly creative children without ADHD symptoms, and 4) 30 (13 male, 17 female) normal controls with no indication of ADHD or high creativity. Participants

were predominantly Caucasian of varying S.E.S. backgrounds, residing in Christchurch, New Zealand. Recruitment was conducted through advertisements in local newspapers, gifted classes, school notices, and an ADD support group newsletter.

Measure of ADHD symptomatology

Conners' Parent Rating Scales - Revised (CRS-R, Conners, 1997). This scale is an 80 item self-report questionnaire which can be used for boys and girls aged 3 to 17. The reliabilities across forms and raters are in the .85 to .95 range. Test-retest reliabilities at 6 to 8 weeks average .70 for the long version forms (Reitman, Hummel, Franz, & Gross, 1998).

Measure of creativity

Torrance Tests of Creative Thinking (TTCT, Torrance, 1962). Creative potential was measured using Figural form A of the TTCT which is made up of three tasks, all of which involve coming up with unusual drawings that have standard shapes (e.g., a pair of straight lines) as a part of them. Each drawing is scored on five subscales: originality, fluency, elaboration, abstractness of titles, and resistance to premature closure. The final percentile ranking is based on a combination of the scores for the five subscales as well as additional aspects like humour, emotional expressiveness, and richness of imagery.

Inclusion/exclusion criteria

Inclusion criteria for the ADHD group: All children in the ADHD group had received a prior diagnosis of ADHD from either a psychiatrist or registered psychologist before entering the study. T-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the long versions of the parent form of the Conners' Rating Scales-Revised (CRS-R; Conners, 1997) were used to confirm ADHD diagnosis. None of the children in this group were highly creative (i.e., they had Torrance Tests of Creative Thinking (TTCT, Torrance, 1962) scores below the 90th percentile).

Inclusion criteria for creative group displaying ADHD symptomatology (CA): Those children who scored in the 90th percentile or higher on the TTCT, and also had T-scores of 65 or above on the DSM-IV inattentive, DSM IV hyperactive-impulsive, and/or DSM IV total subscales of the long version of the parent form of the Conners' Rating Scales-Revised were included in this group. While it would have been ideal to ensure that this group also had a confirmed ADHD diagnosis along with a high creativity score, only four children who entered the study with a diagnosis of ADHD happened to also have high creativity scores. Further, given that the main goal of this study was to explore the relationship among ADHD symptomatology, creativity and psychosocial functioning, rather than relationships associated with an actual ADHD diagnosis, it was deemed to be justified to include children scoring high on the Conners, but who had not been identified as having ADHD, in this group. This inclusion criteria allowed for 12 (40%) of the 30 children recruited for high creativity to be included in this group.

Inclusion criteria for the creative group not displaying ADHD symptomatology (CNA): This group was established by confirming that each child scored in the 90th percentile, or higher, on the TTCT and had T-scores below 60 on the parent form of the Conners' Rating Scales-Revised.

Inclusion criteria for the control group: All the control children had *T*-scores below 60 on the parent form of the Conners' Rating Scales – Revised, and TTCT scores below the 90th percentile.

Exclusion criteria for all groups: Individuals with uncorrected problems in vision or hearing, serious medical problems such as epilepsy or cerebral palsy, an estimated IQ score below 80, using the Block Design and Vocabulary subtests of the WISC-III (Wechsler, 1991), or serious psychopathology, such as psychosis (that precluded an ability to diagnose ADHD accurately), and those with English as a second language, were

excluded. These exclusion criteria did not result in the exclusion of any participants from the analyses.

Exclusion criteria for the control group: Individuals with a history, or current complaints of problems with attention, hyperactivity or impulsivity were excluded. These exclusion criteria resulted in one participant being excluded from the control group.

Measures of psychosocial functioning

Rosenberg Self Esteem Scale (RSE, Rosenberg, 1979). Self-esteem was measured using the RSE, a 10 item, self report questionnaire where the individual indicates to what extent a statement (e.g., "I take a positive attitude toward myself") accurately reflects their self image. Responses include either: strongly agree, agree, disagree, or strongly disagree. The reliability of this measure was found to be good with $r = 0.78$ (Westaway & Wolmarans, 1992).

Revised Child Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985). Anxiety was measured using the RCMAS, a 37 item, true/false, questionnaire. It involves reading each statement and deciding whether or not it is true in relation to the way the individual sees him/herself (e.g., "I worry a lot of the time"). The individual's responses indicate scores on five subscales: total anxiety, physiological anxiety, worry/oversensitivity, social concerns/concentration, and lie. Concurrent validity of the RCMAS has been supported by its correlation with many anxiety measures, particularly the State-Trait Anxiety Inventory for Children (Dierker et. al., 2001; King, Josephs, Gullone, Madden & Ollendick, 1994).

Child Depression Inventory (CDI; Kovacs, 1992). Depression was measured using the CDI, a 27 item self-report measure designed for use with children and adolescents. The questionnaire involves rating the severity of symptoms in the past two weeks, by selecting one of three possible answers (e.g., "I am sad once in a

while", "I am sad many times", or "I am sad all the time"). The individual's responses indicate scores on six subscales: total score, negative mood, interpersonal problems, ineffectiveness, anhedonia, and negative self-esteem. Following an assessment of the internal reliability of this measure, the average split-half correlation resulted in Spearman-Brown, $r = 0.85$ and Guttman split-half, $r = 0.84$ (Helsel & Matson, 1984).

Child Behavior Checklist (CBCL, Achenbach, 1991). The CBCL is a measure designed to identify children who exhibit behavior problems serious enough to warrant clinical intervention. Both the Parent (CBCL) and the Teacher Report Form (TRF) versions of this checklist were used to assess children's behavior. Separate norms are available for male and female children aged 4 to 18 years. The internal consistencies of the CBCL are typically good (i.e., above .80 for most subscales). One week test-retest reliability for the behavioral component of the parent scale was reported as .89 and as .87 for the social competence component of the scale (Reitman, Hummel, Franz & Gross, 1998).

Measures of Family Functioning

New Zealand Socioeconomic Index of Occupational Status (NZSEI, Davis, McLeod, Ransom & Ongley, 1997). Socioeconomic status (SES) was determined using the NZSEI, an index which assigns New Zealand occupations with a socioeconomic score. Scores range from 10 (low SES) to 90 (high SES).

Family Environment Scale (FES; Moos & Moos, 1981). This measure assesses a variety of aspects of family functioning. Overall, three main family dimensions of interpersonal relationships are measured that provide 10 subscales. These are family relationships (cohesion, expressiveness, and conflict), personal growth and development (independence, achievement orientation, intellectual-cultural orientation, active-recreation orientation and moral-religious emphasis), and system maintenance

(organization and control). The FES is widely used, and the subscales have reported moderate internal consistency and discriminant validity (Stuifbergen, 1990).

Parent Version of the Kastan Children's Attributional Style Questionnaire (CASQ; Kaslow, Tanenbaum, Seligman, 1978). Mother's attributions about their children were obtained using the CASQ. The scale involves the mother interpreting the reason behind an event that occurs in relation to her child by selecting one of two possible responses (e.g., "Your child gets a bad grade at school." Response options: A. My child is not a good student or B. Teachers give unfair tests).

Measure of Temperament

Junior Temperament and Character Inventory (JTCI, Luby, Svrakic, McCallum, Przybeck, & Cloninger, 1999). The parent report version of the JTCI was used to examine the child's temperament and emerging personality characteristics. The JTCI has been adapted from the Temperament and Character Inventory (TCI; Cloninger, Przybeck, Svrakic & Wetzel, 1994) and is suitable for use with children aged 9 – 13 years. The measure consists of four temperament dimensions: Harm Avoidance (i.e., fearful), Novelty Seeking (i.e. exploratory), Reward Dependence (i.e., sentimental and affectionate) and Persistence (i.e., industrious); and three character dimensions: Self-directedness (i.e., disciplined), Cooperativeness (i.e, empathic and helpful), and Self-transcendence (i.e idealistic). According to this model, the temperament dimensions are believed to be heritable, to manifest early in life, and to involve preconceptual or unconscious biases in learning. With regard to the character dimensions, heritable temperamental factors are believed to initially motivate the development of these, which once established, continue to impact on the significance and salience of perceived environmental stimuli that the individual responds to (Cloninger, Svrakic, & Pryzybeck, 1993). The JTCI has been shown to

have internal reliability, and to be valid measure of children's temperament (Luby, Svrakic, McCallum, Przybeck, & Cloninger, 1999).

Procedure

Each child was tested individually in a quiet room at the university for one hour. The measures were completed by each participant in the same order to ensure consistency. Ethics approval for the study was gained from the local Human Ethics Committee. Participation was voluntary and included parental and child consent. Parents were asked to fill in the long version of the CPRS-R, the CBCL, the JTCI, and the CASQ (parent version). Permission was gained to send the TRF to a current teacher who knew the child well.

Statistical Analyses

Results were analysed using the Statistical Package for the Social Sciences-windows version 11.5. Univariate analyses of variance were used to examine group difference and if the overall Wilk's Lambda was significant ($p < 0.05$), the subsequent univariate analyses were interpreted. Specific group differences were examined with post-hoc Tukey tests using a p value of .05. Cohen's d effect size (ES) calculations were used to determine the magnitude of group differences for comparisons most relevant to study.

5.4 Results

Sample Characteristics

Average age, CPRS-R, and TTCT scores of the four groups are displayed in Table 1. As group membership would suggest, the CA group were rated by parents as having similar behavioral characteristics to the ADHD group, both of whom were rated higher than the CNA and NC groups. The CA and CNA groups displayed significantly more creative ability, as measured by the TTCT, than the ADHD and NC groups.

Measures of psychosocial functioning

The ADHD group self reported experiencing more anxiety and depressive symptoms than the other three groups; however, there were no group differences in self-esteem (see Table 2). For Total Anxiety, the ADHD group scored higher than the other three groups. This pattern was consistent across all subscales of the RCMAS. For depression, the ADHD group scored higher on the Total score than the other three groups, and again this pattern remained constant across all subscales of the CDI.

Subscale scores of that Child Behavior Checklist that were directly relevant to the hypotheses of the study were analyzed. These included: Withdrawn, Anxious/Depressed, Social problems, and Social on the CBCL, and Withdrawn, Anxious/Depressed, and Social Problems on the TRF (see Table 2). On the CBCL, the ADHD group gained higher scores than the other three groups on Social Problems, and lower scores on the Social subscale of the measure. For the Withdrawn, and Anxious/Depressed subscales, the ADHD group scored higher than the CNA and NC groups, but did not differ significantly from the CA group. For the Social Problems subscale, the CA group differed significantly from the CNA and NC groups. Further, effect size calculations indicated small differences between the ADHD and CA groups for the Withdrawn and Anxious/Depressed subscales and large differences on the Social Problems and Social subscales. For the CA and CNA groups, the effect sizes were medium for all subscales, suggesting that the parents of the CA group are

Table 1

Sample characteristics: means and standard deviations

	ADHD (n=29)		*CA (n=16)*		*CNA (n=18)*		*NC (n=30)*		Wilk's Lambda	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F (3, 92)	Contrasts[a]
Age	11.44	0.85	11.24	0.96	11.10	0.80	11.10	0.89	0.928	
TTCT	37.83	30.48	94.31	3.14	94.89	3.85	45.97	23.37	44.022***	ADHD,NC<CA,CNA
CPRS-R Inattentive	75.43	8.53	70.87	6.45	47.18	5.46	47.32	5.56	109.964***	ADHD,CA>CNA,NC
CPRS-R Hyperactive	82.07	8.29	69.38	13.19	48.29	6.07	47.80	4.93	98.365***	ADHD>CA>CNA,NC
CPRS-R DSM-IV total	81.07	6.19	71.31	9.60	47.47	5.68	47.32	4.97	158.81***	ADHD>CA>CNA,NC

Note: [a]Tukey's HSD, $p < .05$, CA = creative with ADHD symptomatology, CNA = creative without ADHD symptomatology, NC = normal control, CPRS-R = Conners' Parent Rating Scale-Revised, TTCT = Torrance Tests of Creative Thinking, ***$p < .001$.

Table 2

Psychosocial functioning by group: means and standard deviations

	ADHD (n=29)		CA (n=16)		CNA (n=18)		NC (n=30)		Wilk's	Contrasts[a]	Effect Sizes (*d*)			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Lambda		ADHD	CNA	CA	CNA
Variable									*F* (3, 92)		&CA	&CA	&NC	&NC
Rosenberg Self Esteem	8.62	5.31	7.53	3.39	6.58	3.47	7.23	3.83	0.098		0.24	0.28	0.08	0.17
RCMSs: Total Anxiety (*T* scores)	51.69	12.79	42.81	9.52	42.61	10.05	41.90	7.61	5.592***	ADHD>CA,CNA, NC	0.79	0.02	0.11	0.08
CDI : Total Score (*T* scores)	52.62	10.94	45.00	7.27	42.06	5.63	45.17	6.89	7.438***	ADHD>CA, CNA, NC	0.82	0.45	0.02	0.49
CBCL (*T* scores)														
Withdrawn	59.42	9.56	57.25	11.02	52.47	5.35	52.92	6.18	3.852**	ADHD>CNA,NC	0.21	0.55	0.48	0.07
Anxious/Depressed	64.61	11.96	59.31	11.01	53.29	5.74	52.48	4.82	9.638***	ADHD>CNA, NC	0.46	0.69	0.80	0.15
Social Problems	69.32	8.02	60.00	14.07	52.00	4.12	51.80	4.00	26.137***	ADHD>CA>CNA,NC	0.81	0.77	0.79	0.05
Social	35.29	8.22	45.00	9.66	51.29	5.68	50.56	5.37	25.159***	ADHD>CA,CNA,NC	1.08	0.79	0.71	0.13
TRF (*T* scores)														
Withdrawn	56.75	7.91	55.62	6.63	50.28	1.18	51.91	5.45	4.985**	ADHD>CNA,NC	0.15	1.12	0.61	0.41

Anxious/Depressed	58.60	8.41	53.46	4.33	51.61	3.75	51.95	4.70	6.289***	ADHD>CNA,NC	0.77	0.46	0.33	0.08
Social Problems	62.00	7.35	56.92	8.07	52.72	4.21	51.64	3.49	13.002***	ADHD>CNA,NC CA>NC	0.66	0.65	0.85	0.28

Note: [a]Tukey's HSD, $p < 0.05$, CA = creative with ADHD symptomatology, CNA = creative without ADHD symptomatology, NC = normal control, RCMAS= Revised Child Manifest Anxiety Scale, CDI = Child Depression Inventory, CBCL = Child Behavior Checklist, TRF = Teacher Report Form, $*p < .05$, $**p < .01$, $***p < .001$

reporting more of these symptoms in their children than are the parents of the CNA group (see Table 2).

On the TRF of the Child Behavior Checklist, the ADHD group gained higher scores than the CNA and NC groups on all of the subscales. There were no significant differences between the ADHD and CA groups on any of the subscales. For the Social Problems subscale, the CA group scored higher than the NC group. Effect sizes between the ADHD and CA group were small for the Withdrawn subscale and medium for the Anxious/Depressed and Social Problems subscales. There was a large effect size between the CA and CNA groups on the Withdrawn subscale and a medium effect sizes on the Anxious/Depressed and Social Problems subscales, suggesting that group differences may exist, and that the CA group is struggling more in these domains.

Measures of family functioning

The ADHD group differed from the other three in terms of SES and mother's attributions, but did not differ consistently on family environment. For SES, the overall effect for group was significant, $F(3, 92) = 12.566$, $p < 0.001$. Post-hoc analyses showed that both of the creative groups' and the control group's parents had higher SES ratings than the ADHD children's parents. With regard to mother's attributions about their children, the overall group effect was significant, $F(3, 92) = 16.324$, $p < 0.001$. Post-hoc analyses revealed that the mothers of the ADHD children viewed their children significantly more negatively than did the mothers of the children in the other three groups.

There were very few group differences on the Family Environment Scale. For the Conflict subscale, the overall effect for group was significant, $F(3, 92) = 3.487$, $p < 0.05$. Post-hoc analyses showed that the CA group scored lower than the CNA and NC groups indicating that there was less conflict within their families. For the Intellectual subscale, the

overall effect for group was significant, $F(3, 92) = 4.466, p < 0.01$. Post-hoc analyses revealed that the ADHD group scored significantly lower than the CNA and NC groups indicating that their families were less intellectual. For the Recreational subscale, the overall effect for group was significant, $F(3, 92) = 3.330, p < 0.05$. Post-hoc analyses revealed that the ADHD group scored lower than the CNA and NC groups indicating that they engaged in fewer recreational activities. There were no group differences on the Cohesion, Expressiveness, Independence, Achievement, Moral-Religious, Organizational, and Control subscales.

Measures of temperament and character

With regard to both temperament and character, the ADHD and CA groups were rated similarly and were significantly different from the CNA and NC groups (see Table 3). For the temperament dimension of Novelty Seeking, the ADHD group scored higher than the CNA and NC groups, and the CA group scored higher than the NC group. For Reward Dependence the ADHD group scored lower than the CNA group, and for Persistence the ADHD and CA groups both scored lower than the CNA and NC groups. There were no group differences on Harm Avoidance. For the character dimension of Self-Directedness, the ADHD scored higher than all other groups, and the CA group scored higher than the CNA and NC groups. For cooperativeness, the ADHD and CA groups scored higher than the CNA and NC groups. For Self-Transcendence 1, the ADHD group scored higher than the CNA group, and the CA group scored higher than the CNA and NC groups. Effect size calculations confirm this pattern of results with predominantly large effect sizes between the CA and CNA groups, and predominantly small effect sizes between the ADHD and CA groups.

Table 3

Junior Temperament and Character Inventory (Raw Scores) by group: means, standard deviations, ANOVA results and effect sizes

Variable	ADHD (n=29)		CA (n=16)		CNA (n=18)		NC (n=30)		Wilk's Lambda	Contrasts[a]	ES (*d*) ADHD	ES (*d*) CA&
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*F* (3,92)		& CA	CNA
Temperament												
Dimensions:												
Novelty Seeking	10.96	3.29	8.81	3.10	6.59	2.48	5.54	2.89	15.524***	ADHD>CNA,NC CA>NC	0.67	0.79
Harm Avoidance	9.57	5.63	8.63	6.39	8.59	4.70	8.64	4.17	0.203		0.16	0.01
Reward dependence	4.96	2.36	5.88	2.70	7.53	1.42	6.00	2.27	4.581**	ADHD>CNA	0.36	0.76
Persistence	1.21	1.20	1.63	1.31	3.65	1.69	3.82	1.68	18.491***	ADHD,CA<CNA,NC	0.33	1.34
Character Dimensions:												
Self-Directedness	7.42	3.58	11.75	4.04	16.76	3.98	16.32	2.63	36.159***	ADHD<CA<CNA,NC	1.13	1.25
Cooperativeness	10.29	4.57	12.56	4.75	16.88	2.34	16.64	2.54	16.595***	ADHD,CA<CNA,NC	0.49	1.15
Self-Transcendence 1	1.18	1.42	1.75	1.29	0.29	0.69	0.68	0.78	5.422**	ADHD>CNA CA>CNA,NC	0.42	1.41
Self-Transcendence 2	1.21	1.52	1.68	1.70	1.29	1.10	0.73	1.20	1.467		0.29	0.27

Note: [a]Tukey's HSD, $p < .05$; CA = creative with ADHD symptomatology, CNA = creative without ADHD symptomatology, NC = normal control,

$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$

Exploratory Correlations

Given that the effect size calculations suggest that the CA group may differ from the CNA group on a number of the psychosocial measures, correlations were conducted to specifically determine the strength of the relationship between ADHD symptomatology and those psychosocial variables where a significant difference between the CA and CNA groups was apparent. Since the CA group mostly displayed symptoms of inattention as opposed to hyperactivity (see Table 1), Parent's ratings on the Inattentive subscale of the Conner's Parent Rating Scale were used for the analyses. Correlations were conducted using the combined two creative groups only. Table 4 displays the correlations between ADHD symptomatology and CBCL scores, and Table 5 displays correlations between ADHD symptomatology and temperament and character, for the combined creative groups.

Results show that inattentive symptoms of ADHD are related to higher CBCL scores on the Withdrawn, Anxious/Depressed, and Social Problems subscales; and lower scores on the Social subscale which measures how many hobbies and friends a child has. Inattentive symptoms were also related to higher TRF scores on the Withdrawn, Anxious/Depressed, and Social Problems subscales. Parent's ratings of children's temperament and character showed a strong positive relationship between inattention and the temperament dimension of Novelty Seeking, and a strong negative correlation between inattention and Persistence. For the character dimensions, there were strong negative correlations between inattention and Self-Directedness and Cooperativeness, and a strong positive correlation between inattention and Self-Transcendence 1.

Table 4

Correlations between Conners' Parent Ratings of ADHD symptomatology and CBCL scores, collapsing across the two creative groups.

Variable	Inattention (r)
CBCL(*T* scores)	
Withdrawn	0.407**
Anxious/Depressed	0.453**
Social Problems	0.494**
Social	- 0.377*
TRF (*T* scores)	
Withdrawn	0.509**
Anxious/Depressed	0.298*
Social Problems	0.401**

Note: CBCL = Child Behavior Checklist, TRF = Teacher Report Form, *$p < 0.05$, **$p < .01$, ***$p < .001$

Table 5

Correlations between Conners' Parent Ratings of ADHD symptomatology and scores on the Junior Temperament and Character Inventory, collapsing across the two creative groups.

Variable	Inattentive (r)
Temperament Dimensions	
Novelty Seeking	0.412**
Harm Avoidance	0.038
Reward dependence	-0.230
Persistence	-0.603***
Character Dimensions	
Self-Directedness	-0.549***
Cooperativeness	-0.412**
Self-Transcendence 1	0.639***
Self-Transcendence 2	0.256

Note: $*p < .05$, $**p < .01$, $***p < .001$

5.5 Discussion

This study is the first to explore the temperament, character, and general functioning of creative children with and without ADHD symptomatology, and to compare them with both ADHD and normal control children. Although there were few significant group differences between the CA and CNA groups, effect size calculations indicated that parents and teachers reported that the CA group were experiencing more withdrawal, anxiety, depression, and social difficulties than the CNA group. However, it was only on the Anxious/Depressed and Social Problems subscales of the CBCL that they scored within the clinical range. Furthermore, the correlations conducted between ADHD symptomatology and measures of psychosocial functioning, using the combined creative groups, indicated that the presence of ADHD symptomatology in creative children was related to increased levels of both parent and teacher reported withdrawal, anxiety/depression and social problems. The overall pattern of results from this study suggest a continuum effect where increases in the severity of ADHD symptomatology in creative children are related to increases in experiences of withdrawal, anxiety, depression and social difficulties.

Despite the lack of significant group differences in self, parent and teacher reports of depression and anxiety between either creative group and the control group, effect size calculations suggest that there are medium to large differences between the CA and NC groups on parent and teacher reports of anxiety, depression, and social problems; and predominantly small effect sizes between the CNA and NC groups on all measures of anxiety, depression, self esteem and social problems. Thus, the results of this study suggest that creative children displaying ADHD symptomatology experience higher levels of anxiety, depression and social difficulties than controls,

but creative children without the symptoms do not. These findings may explain the contradictory results of studies investigating the relationship between creativity and depression, anxiety or social problems. Future research should consider the levels of ADHD symptomatology when comparing creative and control groups on measures of psychopathology in order to further explore the role of these symptoms in any connections found between creativity and psychopathology.

A further link between the ADHD and CA groups was highlighted by their temperament and character ratings. There were significant differences in the temperament and character of the two creative groups, but little difference in the temperament and character of the ADHD and CA groups. This suggests that both temperament and character may be linked to the development of ADHD-like behavior. Unlike temperament, mother's attributions and family environment did not appear to be related to ADHD-like behavior. Although the findings of this study suggest possible links between temperament, behavior and environment, it is important to note that causation cannot be inferred from this data.

In regard to temperament, the creative group displaying ADHD symptomatology were rated as having a similar temperament to that of the ADHD group, and one that was significantly different from the CNA group. Creativity has repeatedly been linked to the personality characteristic of "openness to experience" which includes novelty seeking (King, McKee, Walker, & Broyles, 1996; McCrae, 1987) and to "sensation seeking" which is similar to novelty seeking (Barron, 1998; Farley, 1985); yet by subdividing the creative group, this study has shown that only the CA group was significantly higher than controls on the inborn temperament dimension of Novelty Seeking.

With the exception of three subscales, family environment did not differ across groups, suggesting that family environment is not strongly linked to the presence of ADHD symptomatology. Similarly mother's attributions about their children did not appear to be linked to the presence of ADHD symptomatology as, if this were the case, one would expect the mothers of both the ADHD and CA groups to have made similar attributions about their children, and that these would differ from the attributions made by the mothers of the CNA and NC groups. This was not the case as there was a significant difference in the attributions of mothers of the ADHD and CA group, and no difference between the CA, CNA and control groups. These results support the findings that parents have positive perceptions of their creative children (Albert & Runco, 1989; Runco et. al., 1992) and contradicts the findings parents do not perceive the personality characteristics of their children favourably (Singh, 1987; Paguio, 1982; Raina et. al., 1980). Further, the findings of this study suggest that it may be the significant impairment imposed by the symptoms of the ADHD group that leads mothers to make negative attributions about their children, rather than the attribution style of the parent leading to ADHD symptomatology.

This study has given us a unique insight into the possible mechanisms underlying the development of ADHD symptompatology. Having two groups (CA and ADHD) that both display similar behaviors, we were able to compare their psychological functioning, character, in born temperament, and family functioning and hypothesise as to which of these factors seem to relate to ADHD symptomatology. The findings of this study appear to support the past research findings that ADHD is not simply a disorder of the environment, but more likely a disorder stemming, at least in part, from a child's biological makeup (Teeter, 1998).

Clinical Implications

Although this study showed that, on average, creative children displaying ADHD symptomatology were not experiencing clinically elevated levels of anxiety, depression, low self esteem, or deficient social skills; parents did rate their anxiety, depression and social problems within the clinical range (i.e. one standard deviation above the mean). Furthermore, based on the correlational analyses within the creative group, the presence of ADHD symptomatology was clearly related to elevated scores on these measures. Therefore, highly creative individuals who display ADHD symptomatology appear to be at a higher risk of developing depression, anxiety, and social difficulties than those creative children without the symptoms.

Limitations

There are a number of limitations that hinder the generalizability of these results. First, the inclusion criteria for the creative group with ADHD sypmtomatology was based on parent ratings rather than a formal diagnostic assessment. Therefore it is unclear how many of these children would have met full criteria for a diagnosis of ADHD. This, in turn, resulted in a heterogeneous sample of creative children with ADHD symptomatology (i.e., one quarter of them had a formal diagnosis of ADHD). However, the analyses were conducted with and without those four children with no change in the pattern of results. Further, we did not assess the ADHD group with a standardized interview, instead the diagnosis came from community practitioners and was then confirmed with parent rating scales, which inevitably produces some variability into the diagnostic procedures. Future studies could include a creative group of children with diagnosed ADHD, and a creative group displaying symptoms of ADHD but not meeting full criteria for the disorder. A third limitation is that because the creative groups were formed experimentally and not directly recruited for ADHD symptomatology, the sample sizes of both of the creative groups were

small, impacting on the power of the results. Fourth, the groups had unequal numbers of male and female participants with too few girls in the ADHD and creative group with ADHD symptoms to determine whether there were differences in functioning based on gender. Fifth, the ADHD group consisted of all three types of ADHD: predominantly inattentive, predominantly hyperactive/impulsive and combined type, but due to small sample sizes in each of these groups, comparisons could not be made within the ADHD sample. Finally, the creativity measure used (TTCT) provides a measure of creative potential rather than creativity per se.

CHAPTER 6

GENERAL DISCUSSION

This dissertation aimed to add to the current literature on ADHD and creativity by further investigating 1) the level of creativity present in children with a diagnosis of ADHD, 2) the degree of ADHD symptomatology present within highly creative children, and 3) the behavioural overlap between the two phenomena that has been noted in the literature (e.g., Cramond, 1994b; Leroux & Levitt-Perlman, 2000). The dissertation also aimed to extend the current findings in this area by examining the impact that these behaviours have on creative children's general functioning.

6.1 Main Findings

With regard to the first study conducted as part of this dissertation, results showed that the creative ability of children with ADHD, as measured by the TTCT, was normally distributed and that children with ADHD were no more creative than those without the disorder. These findings are in accordance with findings by Sang, Yu, Zhangming, and Yu (2002) and Alt (1999), but contradict Shaw and Brown (1991), and Cramond's (1994a) findings. A possible explanation for the discrepancy in findings to date is that both Cramond (1994a) and Shaw and Brown (1991) tested ADHD children who predominantly had high IQs. They also did not determine whether children where taking stimulant medication for their ADHD at the time of testing, thus they may have tested participants while on medication. Both IQ and stimulant medications could possibly have a positive impact on a child's performance on creativity tests and thus may have inflated the levels of creativity within the ADHD samples that they studied.

Despite numerous comments in the literature regarding the similarities in the behavioural manifestations of ADHD and creative children, Cramond (1994a) is the only author to have empirically tested the level of ADHD symptomatology present in a creative sample. She found that 26% of the creative adolescents that she tested self-reported experiencing clinically elevated levels of ADHD symptoms. The second study in this dissertation demonstrated that, in accordance with Cramond's (1994) findings, a large proportion (40%) of creative children displayed ADHD-like behaviour, however, this dissertation went on to demonstrate that they did not meet criteria for an actual diagnosis of ADHD. Although they did not meet full criteria for the disorder, the subtype of ADHD that the creative children were most similar to was the *predominantly inattentive* subtype which includes symptoms like "appearing not to listen when spoken to directly", "often failing to give close attention to details", and "being easily distracted by extraneous stimuli" (American Psychiatric Association, 2000).

In relation to the impact that the presence of ADHD symptomatology has on the cognitive functioning of creative children, the results of the second study indicated that there appeared to be a "continuum effect" where ADHD children had the most severe behavioural symptoms and the most severe cognitive deficits, in particular deficits in processing speed. The creative children displaying symptoms of ADHD had less severe behavioural manifestations as they did not meet criteria for the disorder, and also had less severe processing speed deficits. However, they still had more cognitive deficits than both the creative children without the symptoms and controls. The significant correlation between ADHD symptomatology and processing speed deficits that was found in this study, supports Barkley's (1997) model which

suggests that the behaviours associated with ADHD appear to be linked with cognitive deficits / deficits in prefrontal lobe functioning.

With regard to the third study, that examined psychosocial functioning, the same "continuum effect" pattern was found. The children with ADHD had the most severe behavioural symptoms and the most severe psychosocial difficulties. The creative children displaying ADHD symptoms had less severe behavioural manifestations and also less psychosocial difficulties, but still more than both the creative children without the symptoms and controls. Furthermore, the study showed that specific aspects of temperament and character (i.e. Novelty Seeking, Persistence, Self-Directedness, Cooperativeness, and Self-Transcendence) appeared to be related to the presence of ADHD symptomatology, as ADHD children and those creative children displaying ADHD symptomatology had very similar temperament ratings and ones that were significantly different from the creative children without symptoms and the controls, who did not differ. Finally, the study also indicated that family environment and mother's attributions do not appear to be directly related to the presence or absence of ADHD symptoms. With regard to family environment, there were generally no differences across the four groups. For mothers' attributions, it was only the mothers of the ADHD children that displayed negative attributions about their children. If negative attributions were a significant causal factor in the development of ADHD symptomatology, then one would expect that the mothers of the creative children displaying ADHD symptomatology would also indicate some negative attributions toward their children.

6.2 Interpretation of findings

Overall, this dissertation has shown that, while children with ADHD do not appear to be any more (or less) creative than controls, a high percentage of children who are highly creative do appear to display ADHD-like behaviours yet do not meet full criteria for a diagnosis of ADHD. Furthermore, this dissertation has presented a unique opportunity to compare two groups of children who display similar behaviours, yet still appear to come from distinctly different populations. These comparisons allowed for further exploration of the relationship between these behaviours and numerous cognitive and psychosocial variables and to get an indication of which variables may be directly related to the expression of ADHD-like behaviour.

With regard to the literature on ADHD, the findings of this dissertation support the results of past studies that have investigated the cognitive and psychosocial functioning, temperament, and family dynamics of children with ADHD and suggested that both specific cognitive functioning deficits (Bedard, Ickowicz, Logan, Hogg-Johnson, Schachar, & Tannock, 2003; Nigg, 1999; Oosterlaan, Logan & Sergeant, 1998; Rucklidge & Tannock, 2002) and temperamental dispositions (Nigg, Goldsmith, & Sachek, 2004; Schmeck & Poustka, 2001; Werry et. al., 1987) appear to be involved in the manifestation of the behaviours seen in ADHD, and that these behaviours in turn have an impact on psychosocial functioning (Robin, 1998; Rucklidge & Kaplan, 1997). With regard to cognitive functioning, it is well documented that children with ADHD have difficulties with many cognitive tasks, in particular executive functioning tasks (Nigg, 1999; Oosterlaan, Logan & Sergeant, 1998; Pliszka, Borcherding, Spatley, Keon, & Irick, 1997; Schachar, Mota, Logan, Tannock, & Klim, 2000; Seidman, Biederman, Faraone, Weber, & Ouellette, 1997).

Moreover, Barkley (1997) has developed a model suggesting that it is these executive functioning deficits that underlie the hyperactive behaviour we see in children with ADHD. This dissertation has supported the idea that specific cognitive deficits are related to the behaviours seen in ADHD as both the children with the disorder and the creative children displaying these types of behaviours showed more deficits than the children who did not display any ADHD symptomatology. However, the results from study two suggest that it may not be poor executive functioning in general (such as working memory, planning, and problem solving) that is the driving mechanism behind the behaviours seen in ADHD, but rather processing speed and reaction times in particular. Yet, although further research is needed in order to determine which specific cognitive factors appear to play the largest role in producing the behaviours seen in ADHD, the positive continuum effect seen in study two between the severity of cognitive deficits (particularly processing speed) and the severity of the behavioural symptoms of ADHD, shows that the two factors are linked in a linear fashion in that as one increases so does the other. This supports Barkley's (1997) model which predicts that as cognitve deficits increase, ADHD symptomatology will increase.

Furthermore, although Barkley (1997) stated that his model only applied to the *predominantly hyperactive* subtype of ADHD, results of the second study in this dissertation suggest that the model may apply to the *predominantly inattentive subtype* as well, as the creative children tested in the study displayed mostly inattentive symptoms. Also, the finding that the creative children displaying ADHD symptomatology where mostly showing inattentive symptoms is in line with Carson, Peterson and Higgins' (2003) research that found that highly creative individuals have difficulties with latent inhibition, which is the ability to filter out irrelevant

information. Further, numerous creativity authors have noted that attention to a wide array of stimuli is essential in the creative process as the individual is able to consider many possibilities that they may have missed if they had a more narrow focus (e.g., Eysenk, 1999; Wallach, 1970). With this in mind, it is not surprising that many highly creative children have difficulties with measures of cognition and attention, as this may be the very factor that makes them creative. Moreover, given the argument in the ADHD literature that deficits in cognitive functioning are what underlie the behavioural manifestations of the disorder, it makes sense that if creative children have similar cognitive deficits then they should have similar behavioural symptoms too.

Cognitive / executive function deficits are not the only factor suggested to lead to the behaviours seen in ADHD, researchers have suggested that temperament could also play a role (Cushman & Johnson, 2001; Lemery, 2000). In particular, the temperament dimension of *novelty seeking* has repeatedly been linked to ADHD (Grady et. al., 2003; Nigg, Goldsmith, & Sachek, 2004; Tillman et. al., 2003). Associations have also been reported between the 7-repeat (7R) allele of the human dopamine receptor D4 (DRD4) gene and both the Temperament dimension of novelty seeking and ADHD (Grady et. al., 2003). Further, Carey and McDevitt (1995) have argued that the "low-task-orientation" temperament cluster predisposes a child to developing ADHD and suggest that there are multiple causes of ADHD ranging from cognitive deficits to extremes of temperament. Further, they proposed that "...many of the children now being given this diagnosis of brain dysfunction and disorder simply have normal temperament variations that do not fit at school and that nothing at all is wrong with their brains" (p147). In other words, they were suggesting that many individuals are diagnosed as having ADHD when in fact there is simply a bad

fit between their temperament and their environment, and they do not actually have a disorder.

Carey and McDevitt's (1995) argument ties in with the concerns raised by numerous authors in the creativity literature where it has been noted that many creative children display similar behaviours to ADHD children, and concerns have been raised with regard to the risk of misdiagnosis of creative children as having ADHD (Cramond, 1994; Leroux & Levitt-Perlman, 2000). Both ADHD and creativity have been linked to similar temperamental dispositions such as novelty seeking and openness to experience (King, McKee Walker, & Broyles, 1996; Schmeck & Poustka, 2001) and therefore would be expected to share similar behavioural characteristics. Therefore, as well as there being similarities in the cognitive functioning of ADHD and creative children, there are also similarities in their temperaments. It may be that what prevents creative children from developing the full diagnosable disorder is the fact that, given the results of studies two and three in this dissertation, they appear to possess all of these attributes to a lesser degree and therefore are not significantly impaired by them. Some authors have argued that disorders described in the DSM-IV (American Psychiatric Association, 2000) could be seen as falling on a continuum rather than there being a clear cut point at which *normal* behaviours become *abnormal* (Costa & Widiger, 1994; Heumann & Morey, 1990; Widiger, 1993). With this in mind, it may be that creativity is related to elevated levels of the factors associated with ADHD, placing these children higher on the continuum than those who are not creative, yet not high enough to lead to significant impairment and to meet criteria for a psychiatric disorder.

Thus far we have seen that the findings of this dissertation have supported past research which has suggested that both deficits in cognitive functioning and specific

temperamental dispositions appear to play a causal role in the development of ADHD symptomatology. Although it has been suggested that family environments and parental attributions may also play a causal role in the development of ADHD symptomatology (Biederman et. al., 1995; Costas, 1995), the contradictory research findings in this area make it difficult to make such an inference (Greenson, 2001; Rey, Walter, Plapp, & Denshire, 2000). Further, some authors have proposed that it is most likely the presence of an ADHD child in the family that leads to higher levels of conflict in the family, rather than the opposite interpretation where high conflict has been suggested to lead to the development of ADHD symptomatology ((Fretz, 1998; Smith, 1999). The findings of study three in this dissertation have supported the idea that the environment in which a child grows up does not lead to the development of ADHD symptomatology, as neither family environment nor mother's attributions about their children were consistent between the two groups of children displaying ADHD symptomatology.

As well as examining possible causal mechanisms, past studies have also investigated the impact of ADHD symptomatology on an individual's psychosocial functioning, and have found that the expression of the behaviours seen in ADHD leads to both difficulties in the classroom and in relationships with peers (Robin, 1998; Rucklidge & Kaplan, 1997). This in turn increases the risk of developing further psychological problems such as anxiety, depression and low self-esteem (Robin, 1998; Rucklidge & Kaplan, 1997). In support of these findings, the third study in this dissertation has shown that there is a positive correlation between the display of ADHD-like behaviour and deficits in psychosocial functioning – in particular depression, anxiety and self-esteem.

Therefore, the overall suggestion based on the results of this dissertation, is that both specific cognitive deficits and temperamental characteristics appear to lead to the manifestation of the subset of behaviours seen in ADHD; and further that these behaviours pose as a risk for the development of additional psychological difficulties such as depression, anxiety, and low self-esteem due to the negative impact that they have on the child's ability to focus in the classroom and interact appropriately with their peers. However, family environment and the attributions that mothers make about their children do not appear to play a causal role in the manifestation of ADHD symptomatology.

With regard to creativity, past research has shown that deficits in cognition, particularly attention, are present in this population (Carson et. al., 2003). These findings were supported by the results of study two in this dissertation where a subgroup of creative children displayed deficits in cognitive functioning, particularly processing speed. An explanation for why only a subgroup of the creative children was found to have specific cognitive difficulties is that the TTCT is a measure of creative potential rather than a measure of actual creative achievement. In contrast, Carson et. al. (2003) studied actual life time creative achievers when investigating latent inhibition deficits within a creative population. Therefore, it is possible that those children with creative potential, as measured by the TTCT, who display ADHD symptomatology will have latent inhibition deficits and will be the ones who will go on to become true creators. Only further research can clarify this hypothesis.

Given what is known, from the ADHD literature, about the impact of specific cognitive deficits on behaviour, the link between ADHD and creativity becomes demystified when the results of study two are considered. This study showed that both populations had similar cognitive difficulties which appeared to be underlying the

behavioural similarities between the two. Further, study three showed that they also shared a similar temperamental disposition which has also been linked to ADHD. The presence of ADHD-like behaviours in this subgroup of creative children may be helpful in understanding psychosocial difficulties which have been found in some studies of creative populations; and may also be used to explain the contradiction in findings to date. On the one hand, there are studies which have found that creative individuals experience more low mood (Hershman & Lieb, 1998; Papworth & James, 2003), anxiety (Carlsson, 2002; Carlsson, Wendt, & Risberg, 2000), and difficulties making friends (Ochse, 1990) than controls. Others have found that there was no correlation between creativity and current depressive state (Sitton & Hughes, 1995), that creative children are less anxious than controls (Asthana, 1993; Matejik, Kovac, & Kondas, 1988), and that highly creative children were not less sociable, less cooperative, or more defiant and rebellious than their less creative peers. (Smith & Moran, 1990). The results of study three of this dissertation suggest that if creative children display ADHD-like behaviour they are likely to also display the psychosocial difficulties that have been linked with ADHD symptomatology in the literature; and if they do not display the behavioural symptoms of ADHD, they do not appear to display the psychosocial deficits either. Thus the contradiction in the findings in the literature to date may be associated with the level of ADHD symptomatology present in the sample tested.

6.3 Limitations

There are a number of limitations inherent in this dissertation. First, only small samples were used in the study. In particular, because the creative groups were

formed experimentally and not directly recruited for ADHD symptomatology, the sample sizes of both of the creative groups were small, impacting on power. Second, there was no comparison to children who were both highly creative and met full criteria for a diagnosis of ADHD. Future studies could include a creative group of children with diagnosed ADHD, although, based on experience from data collection for this study, such a sample would likely be very difficult to recruit. Third, the children in the ADHD group were not assessed using a standardized interview often used in research, instead the diagnosis came from community practitioners and was then confirmed with rating scales, producing some variability into the diagnostic procedures. Fourth, the ADHD group consisted of all three types of ADHD: predominantly inattentive, predominantly hyperactive/impulsive and combined type, but due to small sample sizes in each of these groups, comparisons could not be made within the ADHD sample. Fifth, the small number of girls in the both the ADHD and creative with ADHD symptomatology groups made it impossible to conduct comparisons based on gender. Given the known gender differences in psychosocial functioning of ADHD children (Rucklidge & Tannock, 2002), future studies should investigate these differences in a creative population to see whether females who display ADHD symptomatology express them in a similar manner to the way females with a full diagnosis of ADHD do. Finally, the main measure of creativity used in this dissertation, the TTCT, is believed to be a measure of creative potential only, thus scores on this measure are an indicator of an individual's potential ability to create rather than their creativity as such.

6.4 Strengths

The primary strength of the present dissertation is its contribution to the literature. It is the first to compare ADHD and two types of creative children and to

examine the cognitive and psychosocial functioning of the two types of creative children. Furthermore, the wide range of variables that were assessed in the dissertation enabled a broad yet detailed focus on a number of key areas which enables us to more richly and completely understand the impact of ADHD symptomatology on the general functioning of creative children. Given the depth and span of the research, the central purpose of understanding the differences between ADHD and creative children was well served. Another key asset is that a number of informants (i.e. parents, teachers, children themselves, and in the case of the ADHD group - reports from a psychologist or psychiatrist) reported on the measures used, enabling us to gather data across a range of settings and opinions.

6.5 Clinical Implications

Concerns that creative children will be misdiagnosed as having ADHD have repeatedly been raised in the literature (e.g., Cramond, 1994b; Leroux & Levitt-Perlman, 2000). Yet, none of the creative children that took part in this research met full criteria for a diagnosis of ADHD, showing that their symptoms were not problematic in their environments, and not raising concerns for parents and teachers. Thus none of these children seemed to be at risk of being misdiagnosed as their parents and teachers did not perceive their behaviour as problematic. The results of this study therefore suggest that many of the concerns raised in relation to misdiagnosis may be unfounded.

6.6 Overall Conclusions

The general finding of this dissertation was that a large percentage of creative children have similar behaviours, cognitive deficits, psychological difficulties, and

temperamental characteristics to ADHD children, yet their symptoms and difficulties appear less severe than those of children who meet full criteria for a diagnosis of ADHD. Family environment and mother's attributions do not appear to impact on the presence/absence of ADHD symptomatology, yet temperament does. Although not meeting full criteria for ADHD, creative children who display ADHD symptomatology are experiencing similar deficits to children diagnosed with the disorder, thus these need to be addressed when working with these children. It may be that creative children displaying ADHD symptoms have a vulnerability that, to date, has not been stressed.

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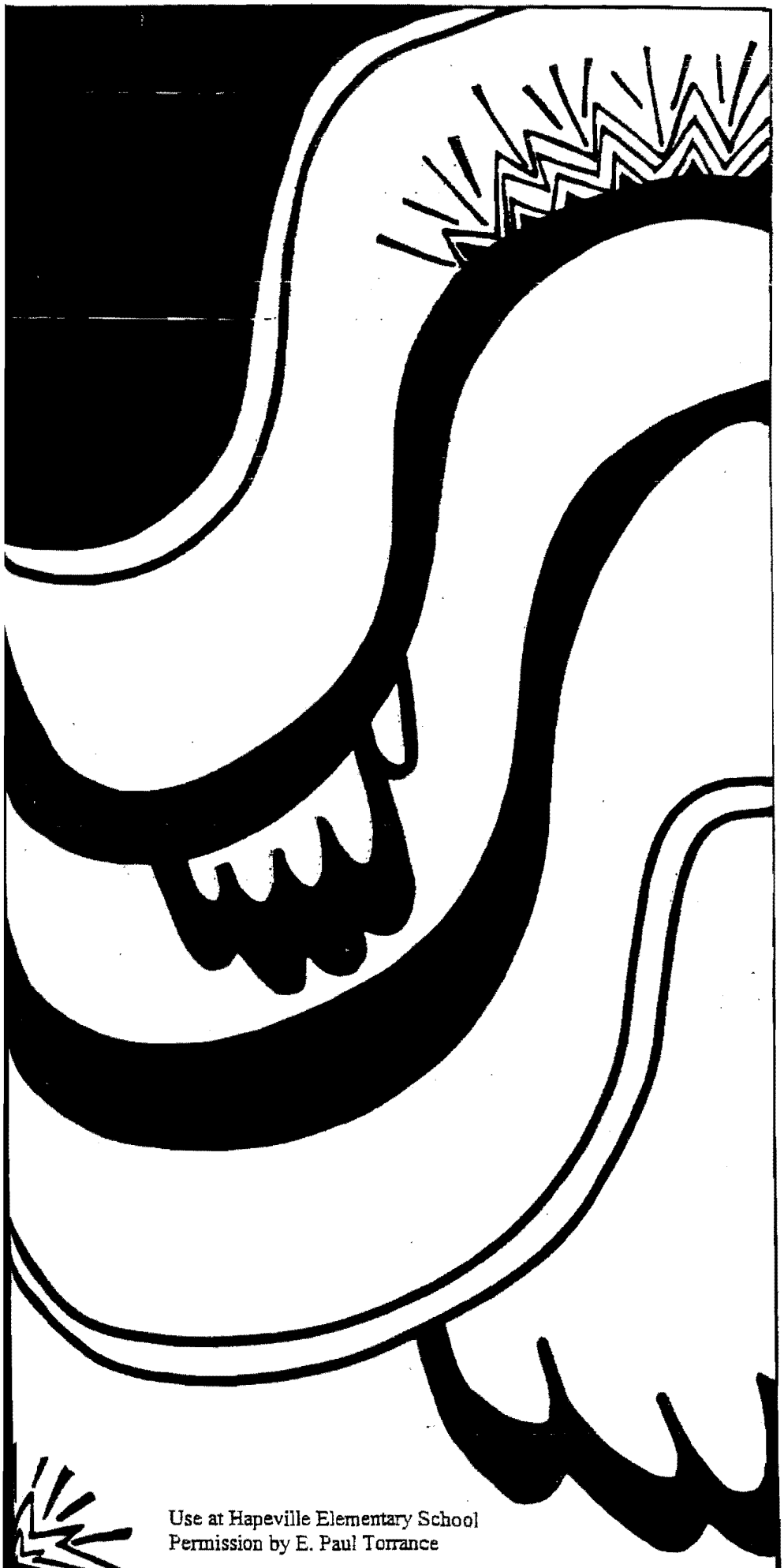
APPENDIX 1

Neurocognitive Measures

1. Torrance Tests of Creative Thinking – Figural Form A
2. WISC III: Block, Design, Vocabulary, Coding, Symbol Search, Digit Span, Arithmetic
3. Rapid Automatized Naming Task
4. Stop Task
5. Stroop Task
6. Stroop Negative Priming Task
7. Tower of London

Psychosocial Measures

8. Rosenberg Self Esteem Scale
9. Revised Child Manifest Anxiety Scale
10. Child Depression Inventory



THINKING CREATIVELY WITH PICTURES

By E. Paul Torrance

FIGURAL BOOKLET A

NAME_____

AGE_____ SEX_____

SCHOOL_____

GRADE_____

CITY_____

DATE_____

Use at Hapeville Elementary School
Permission by E. Paul Torrance

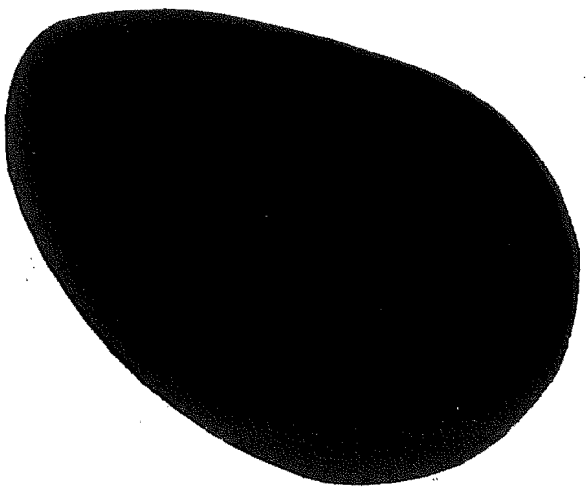
SCHOLASTIC TESTING SERVICE, INC.
480 Meyer Road
Bensenville, IL 60106-1617

Activity 1. PICTURE CONSTRUCTION

On the opposite page is a curved shape. Think of a picture or an object which you can draw with this shape as a part.

Try to think of a picture that no one else will think of. Keep adding new ideas to your first idea to make it tell as interesting and as exciting a story as you can.

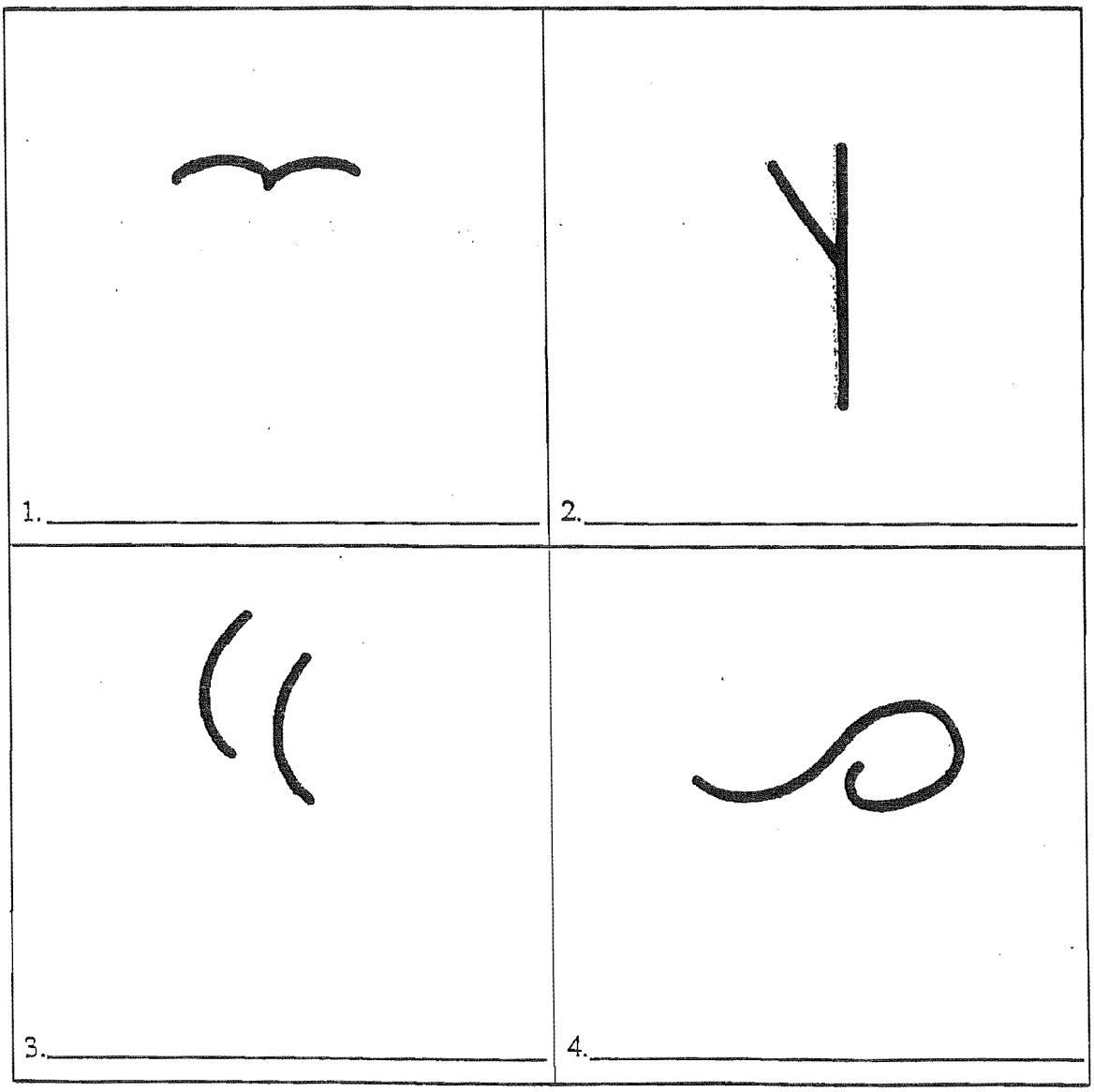
When you have completed your picture, think up a name or title for it and write it at the bottom of the page in the space provided. Make your title as clever and unusual as possible. Use it to help tell your story.

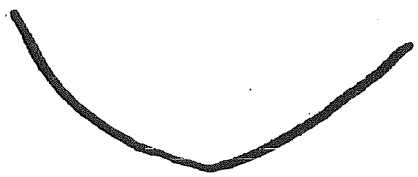


YOUR TITLE: _____

Activity 2. PICTURE COMPLETION

By adding lines to the incomplete figures on this and the next page, you can sketch some interesting objects or pictures. Again, try to think of some picture or object that no one else will think of. Try to make it tell as complete and as interesting a story as you can by adding to and building up your first idea. Make up an interesting title for each of your drawings and write it at the bottom of each block next to the number of the figure.





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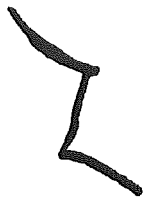
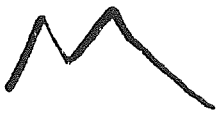


6._____

7._____

8._____

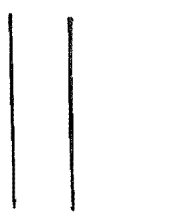


9._____

10._____

Activity 3. LINES

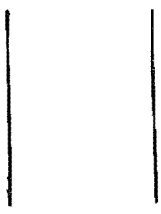
In ten minutes see how many objects or pictures you can make from the pairs of straight lines below and on the next two pages. The pairs of straight lines should be the main part of whatever you make. With pencil or crayon add lines to the pairs of lines to complete your picture. You can place marks between the lines, on the lines, and outside the lines—wherever you want to in order to make your picture. Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles in the spaces provided.



1._____

2._____

3._____



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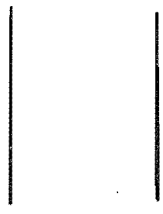
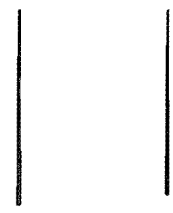


5._____



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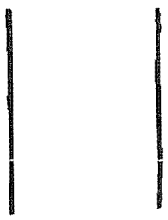

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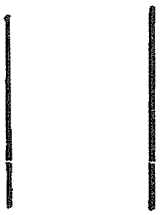

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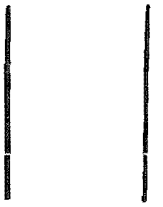

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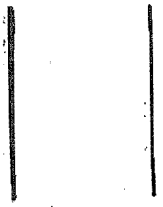

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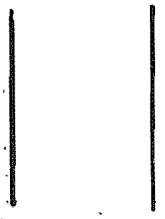

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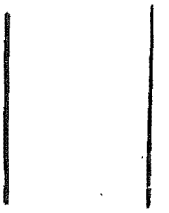

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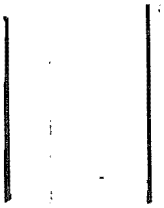

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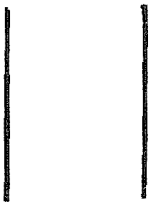

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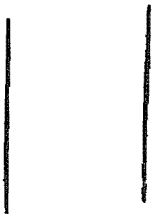

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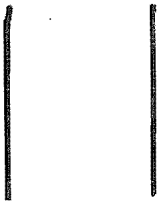

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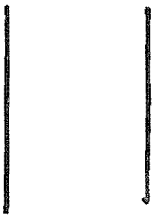

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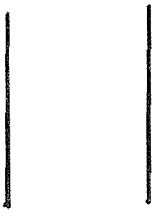
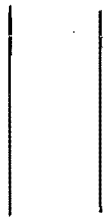
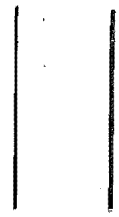


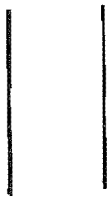
18. _____

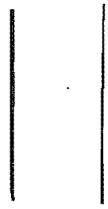
GO ON TO NEXT PAGE

19. 

20. 

21. 

22. 

23. 

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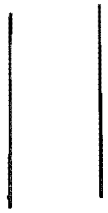
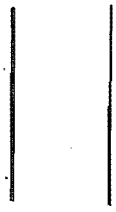
25. 

26. 

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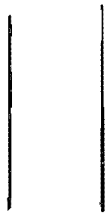
28. 

29.

30.

WISC-III®

Wechsler Intelligence Scale for Children®–Third Edition

Name _____ Sex _____

School _____ Grade _____

Examiner _____ Handedness _____

Subtests	Raw Scores	Scaled Scores
Picture Completion		
Information		
Coding		
Similarities		
Picture Arrangement		
Arithmetic		
Block Design		
Vocabulary		
Object Assembly		
Comprehension		
(Symbol Search)		
(Digit Span)		
(Mazes)		
Sum of Scaled Scores		

Verbal | Perfor. | VC | PO | FD | PS

Full Scale Score

OPTIONAL

	Year	Month	Day
Date Tested			
Date of Birth			
Age			

	Score	IQ/ Index	%ile	% Confidence Interval
Verbal				–
Performance				–
Full Scale				–
VC				–
PO				–
FD				–
PS				–

Subtest Scores

	Verbal						Performance						
	Inf	Sim	Ari	Voc	Com	DS	PC	Cd	PA	BD	OA	SS	Mz
19	•	•	•	•	•	•	•	•	•	•	•	•	•
18	•	•	•	•	•	•	•	•	•	•	•	•	•
17	•	•	•	•	•	•	•	•	•	•	•	•	•
16	•	•	•	•	•	•	•	•	•	•	•	•	•
15	•	•	•	•	•	•	•	•	•	•	•	•	•
14	•	•	•	•	•	•	•	•	•	•	•	•	•
13	•	•	•	•	•	•	•	•	•	•	•	•	•
12	•	•	•	•	•	•	•	•	•	•	•	•	•
11	•	•	•	•	•	•	•	•	•	•	•	•	•
10	•	•	•	•	•	•	•	•	•	•	•	•	•
9	•	•	•	•	•	•	•	•	•	•	•	•	•
8	•	•	•	•	•	•	•	•	•	•	•	•	•
7	•	•	•	•	•	•	•	•	•	•	•	•	•
6	•	•	•	•	•	•	•	•	•	•	•	•	•
5	•	•	•	•	•	•	•	•	•	•	•	•	•
4	•	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•	•
1	•	•	•	•	•	•	•	•	•	•	•	•	•

IQ Scores | Index Scores (Optional)

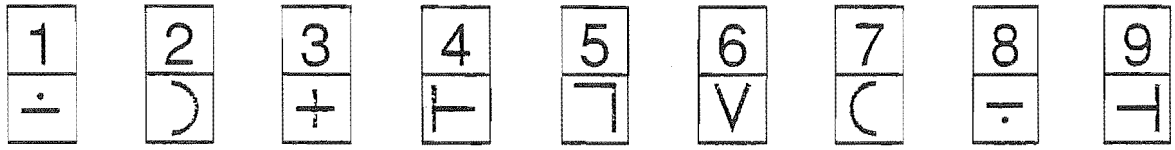
VIQ	PIQ	FSIQ	VCI	POI	FDI	PSI

160 150 140 130 120 110 100 90 80 70 60 50 40

THE PSYCHOLOGICAL CORPORATION®
HARCOURT BRACE JOVANOVICH, INC.

09–9800

B



SAMPLE

2	1	4	6	3	5	2	1	3	4	2	1	3	1	2	3	1	4	2	6	3

1	2	5	1	3	1	5	4	2	7	4	6	9	2	5	8	4	7	6	1	8

7	5	4	8	6	9	4	3	1	8	2	9	7	6	2	5	8	7	3	6	4

5	9	4	1	6	8	9	3	7	5	1	4	9	1	5	8	7	6	9	7	8

2	4	8	3	5	6	7	1	9	4	3	6	2	7	9	3	5	6	7	4	5

2	7	8	1	3	9	2	6	8	4	1	3	2	6	4	9	3	8	5	1	8

5. Picture Arrangement

Discontinue after 3 consecutive failures.
Items 1 and 2 are considered failed only if **both** trials are failed.
For ages 9–16, normal sequence of preceding items after failure on Item 3.

	Correct Item Arrangement	Time Limit	Complet. Time	Response Order	Score Circle the appropriate score.					
All Ages	Sample: CAN									
6–8	1. FUN Trial 1	45"			0		2			
	Trial 2	45"			0	1				
	2. DOG Trial 1	45"			0		2			
	Trial 2	45"			0	1				
9–16	3. WALK	45"			0		16–45 2	11–15 3	6–10 4	1–5 5
	4. MILK	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	5. CHASE	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	6. CASH	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	7. WORMS	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	8. SMOKE	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	9. BENCH	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	10. DUCK	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	11. STORM	45"			0		21–45 2	16–20 3	11–15 4	1–10 5
	12. WETDOG DOGWET	60"			0		26–60 2	16–25 3	11–15 4	1–10 5
	13. FARM	60"			0		26–60 2	16–25 3	11–15 4	1–10 5
	14. SHADOW	60"			0	WODAHS 1	31–60 2	26–30 3	21–25 4	1–20 5

Total Subtest Score (Maximum = 64) ____

6. Arithmetic

Discontinue after 3 consecutive failures.
For ages 7–16, reverse sequence of preceding items after failure on either of first two items administered.

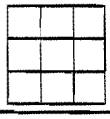
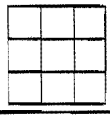
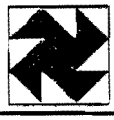
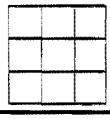
	Problem	Time Limit	Complet. Time	Correct Response	Response	Score Circle one.			Problem	Time Limit	Complet. Time	Correct Response	Response	Score Circle one.		
6	1. Count birds	30"		3		0	1		13. Jim	30"		14		0	1	
	2. Count trees	30"		12		0	1	13–16	14. Newspapers	30"		7		0	1	
	3. Leave 4	30"		4		0	1		15. T-shirts	30"		$24.00		0	1	
	4. Leave 9	30"		9		0	1		16. Milk	30"		11		0	1	
	5. Ice cream	30"		2		0	1		17. Dollars	30"		9		0	1	
7–8	6. Apple	30"		2		0	1		18. Dozen	45"		10¢		0	1	
	7. Books	30"		4		0	1		19. Boxes	75"		$40.00		0	11–75 1	1–10 2
	8. Crayons	30"		5		0	1		20. Money	75"		$8.50		0	11–75 1	1–10 2
	9. Pennies	30"		6		0	1		21. Trip	75"		45mph		0	11–75 1	1–10 2
	10. Cookies	30"		3		0	1		22. Pens	75"		3/10, 6/20 or 30%		0	11–75 1	1–10 2
	11. Pencils	30"		6		0	1		23. Bicycle	75"		$42.00		0	11–75 1	1–10 2
12	12. Candy	30"		7		0	1		24. Cars	75"		48		0	11–75 1	1–10 2

Total Subtest Score (Maximum = 30) ____

7. Block Design

Discontinue after 2 consecutive failures.
For ages 8–16, normal sequence of preceding items after failure on either trial of Design 3.

Child

	Correct Design	Time Limit	Incorrect Design	Complet. Time	Correct Design	Score Circle the appropriate score for each design.
6–7	1. 	30"	Trial 1  Trial 2 		Y N	0 — Trial 2: 1 — Trial 1: 2
	2. 	45"	Trial 1  Trial 2 		Y N	0 — Trial 2: 1 — Trial 1: 2
8–16	3. 	45"	Trial 1  Trial 2 		Y N	0 — Trial 2: 1 — Trial 1: 2
	4. 	45"			Y N	0 — 16–45: 4 — 11–15: 5 — 6–10: 6 — 1–5: 7
	5. 	45"			Y N	0 — 21–45: 4 — 16–20: 5 — 11–15: 6 — 1–10: 7
	6. 	75"			Y N	0 — 21–75: 4 — 16–20: 5 — 11–15: 6 — 1–10: 7
	7. 	75"			Y N	0 — 21–75: 4 — 16–20: 5 — 11–15: 6 — 1–10: 7
	8. 	75"			Y N	0 — 21–75: 4 — 16–20: 5 — 11–15: 6 — 1–10: 7
	9. 	75"			Y N	0 — 26–75: 4 — 16–25: 5 — 11–15: 6 — 1–10: 7
	10. 	120"			Y N	0 — 41–120: 4 — 31–40: 5 — 26–30: 6 — 1–25: 7
	11. 	120"			Y N	0 — 56–120: 4 — 36–55: 5 — 31–35: 6 — 1–30: 7
	12. 	120"			Y N	0 — 56–120: 4 — 36–55: 5 — 31–35: 6 — 1–30: 7

Examiner

Total Subtest Score
(Maximum = 69)

8. Vocabulary

Discontinue after 4 consecutive failures.
For ages 9–16, reverse sequence of preceding items after failure (0 points) or partial credit (1 point) on either of first two items administered.

	Item	Response	Score 0, 1, or 2
8	1. Clock		
	2. Hat		
10	3. Umbrella		
	4. Bicycle		
13	5. Cow		
	6. Alphabet		

8. Vocabulary (*continued*)

Item	Response	Score 0, 1, or 2
4-16 **7.** Donkey		
8. Thief		
9. Leave		
10. Brave		
11. Island		
12. Ancient		
13. Nonsense		
14. Absorb		
15. Fable		
16. Precise		
17. Migrate		
18. Mimic		
19. Transparent		
20. Strenuous		
21. Boast		
22. Unanimous		
23. Seclude		
24. Rivalry		
25. Amendment		
26. Compel		
27. Affliction		
28. Imminent		
29. Aberration		
30. Dilatory		

Total Subtest Score
(Maximum = 60)

11. Symbol Search

Discontinue after 120 seconds.

	6–7 Part A	8–16 Part B
Time Limit	120"	120"
Complet. Time		
Number Correct		
Number Incorrect		
Total Subtest Score	Max. = 45	Max. = 45

12. Digit Span

For both Digits Forward and Digits Backward, administer both trials of each item even if Trial 1 is passed. Discontinue after failure of *both* trials of any item.
Administer Digits Backward even if Digits Forward score is 0.

	Digits Forward Trial 1/Response	Trial Score	Trial 2/Response	Trial Score	Item Score 0,1,c
All Ages 1.	2 – 9		4 – 6		
2.	3 – 8 – 6		6 – 1 – 2		
3.	3 – 4 – 1 – 7		6 – 1 – 5 – 8		
4.	8 – 4 – 2 – 3 – 9		5 – 2 – 1 – 8 – 6		
5.	3 – 8 – 9 – 1 – 7 – 4		7 – 9 – 6 – 4 – 8 – 3		
6.	5 – 1 – 7 – 4 – 2 – 3 – 8		9 – 8 – 5 – 2 – 1 – 6 – 3		
7.	1 – 6 – 4 – 5 – 9 – 7 – 6 – 3		2 – 9 – 7 – 6 – 3 – 1 – 5 – 4		
8.	5 – 3 – 8 – 7 – 1 – 2 – 4 – 6 – 9		4 – 2 – 6 – 9 – 1 – 7 – 8 – 3 – 5		

Digits Forward Score (Maximum = 16)

	Digits Backward Trial 1/Response	Trial Score	Trial 2/Response	Trial Score	Item Score 0,1,c
All Ages	Sample 8 – 2		5 – 6		
1.	2 – 5		6 – 3		
2.	5 – 7 – 4		2 – 5 – 9		
3.	7 – 2 – 9 – 6		8 – 4 – 9 – 3		
4.	4 – 1 – 3 – 5 – 7		9 – 7 – 8 – 5 – 2		
5.	1 – 6 – 5 – 2 – 9 – 8		3 – 6 – 7 – 1 – 9 – 4		
6.	8 – 5 – 9 – 2 – 3 – 4 – 2		4 – 5 – 7 – 9 – 2 – 8 – 1		
7.	6 – 9 – 1 – 6 – 3 – 2 – 5 – 8		3 – 1 – 7 – 9 – 5 – 4 – 8 – 2		

Digits Backward Score (Maximum = 14)

Total Subtest Score (Maximum = 30)

13. Mazes

Discontinue after 2 consecutive failures.
For ages 8–16, normal sequence of Mazes 1–3 after partial credit on Maze 4; normal sequence of Sample ar
Mazes 1–3 after failure on Maze 4.

Maze	Time Limit	Complet. Time	Number of Errors	Score — Circle the appropriate score for each maze.					
6–7 Sample									
1.	30"						2+ Errors 0	1 Error 1	0 Errors 2
2.	30"						2+ Errors 0	1 Error 1	0 Errors 2
3.	30"						2+ Errors 0	1 Error 1	0 Errors 2
8–16 4.	30"						2+ Errors 0	1 Error 1	0 Errors 2
5.	45"						2+ Errors 0	1 Error 1	0 Errors 2
6.	60"						2+ Errors 0	1 Error 1	0 Errors 2
7.	120"					3+ Errors 0	2 Errors 1	1 Error 2	0 Errors 3
8.	120"				4+ Errors 0	3 Errors 1	2 Errors 2	1 Error 3	0 Errors 4
9.	150"				4+ Errors 0	3 Errors 1	2 Errors 2	1 Error 3	0 Errors 4
10.	150"			5+ Errors 0	4 Errors 1	3 Errors 2	2 Errors 3	1 Error 4	0 Errors 5

Total Subtest Score (Maximum = 28)

Name _____ Date _____

WISC-III®
Wechsler Intelligence Scale for Children®–Third Edition

THE PSYCHOLOGICAL CORPORATION®
HARCOURT BRACE JOVANOVICH, INC.

09–980004

WISC-III®

SYMBOL SEARCH
RESPONSE BOOKLET

Child's Name _____

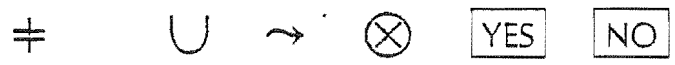
Date _____

Examiner _____

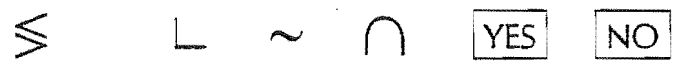
_____

PART A

SAMPLE ITEMS:

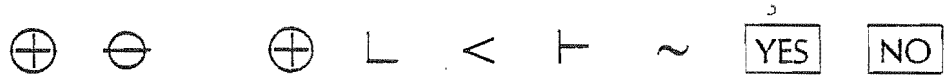


PRACTICE ITEMS:



PART B

SAMPLE ITEMS:



PRACTICE ITEMS:

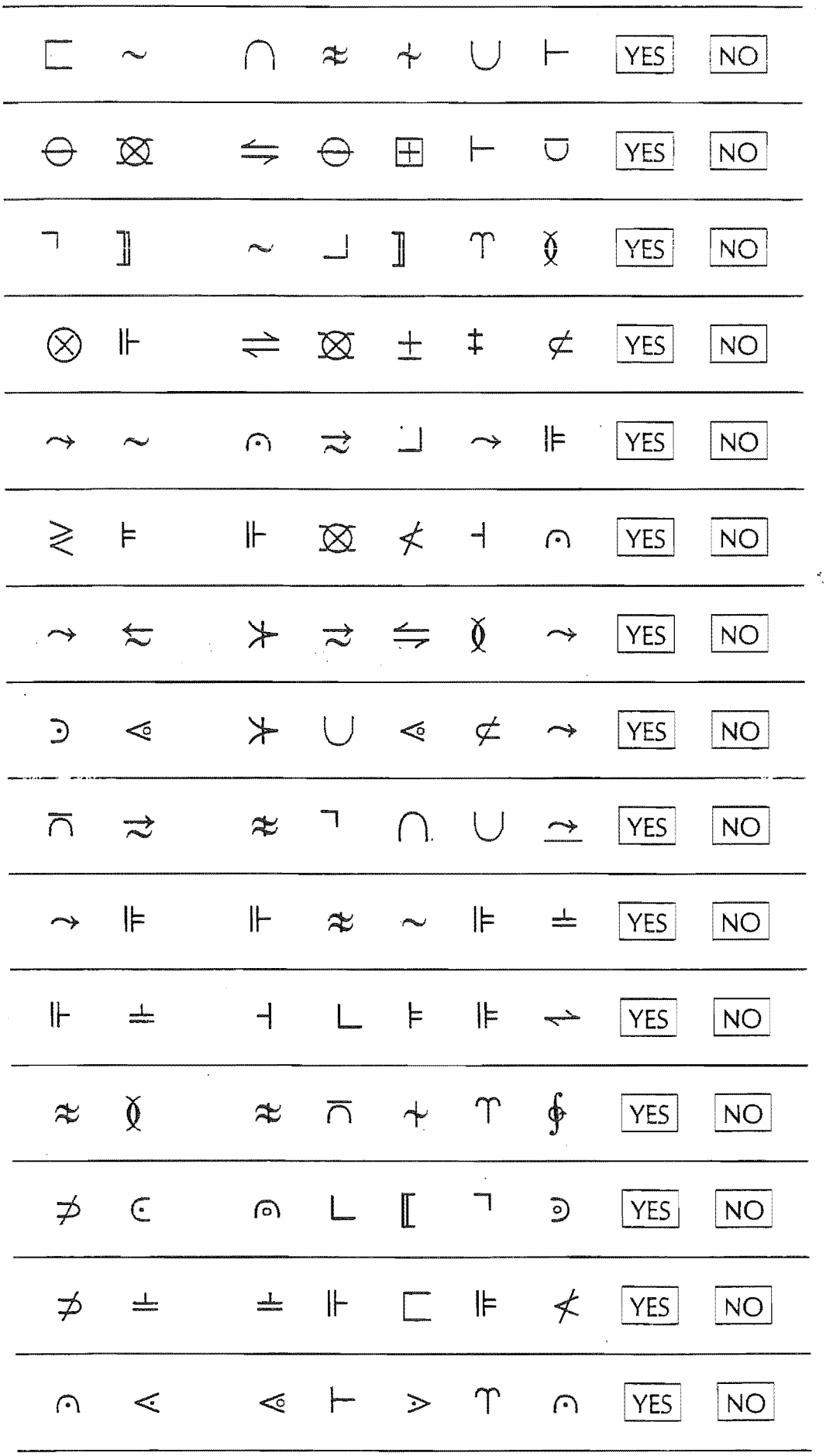
THE PSYCHOLOGICAL CORPORATION®

A Harcourt Canada Assessment Company

Printed in Canada.

0-7747-5218-1


YES
NO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YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
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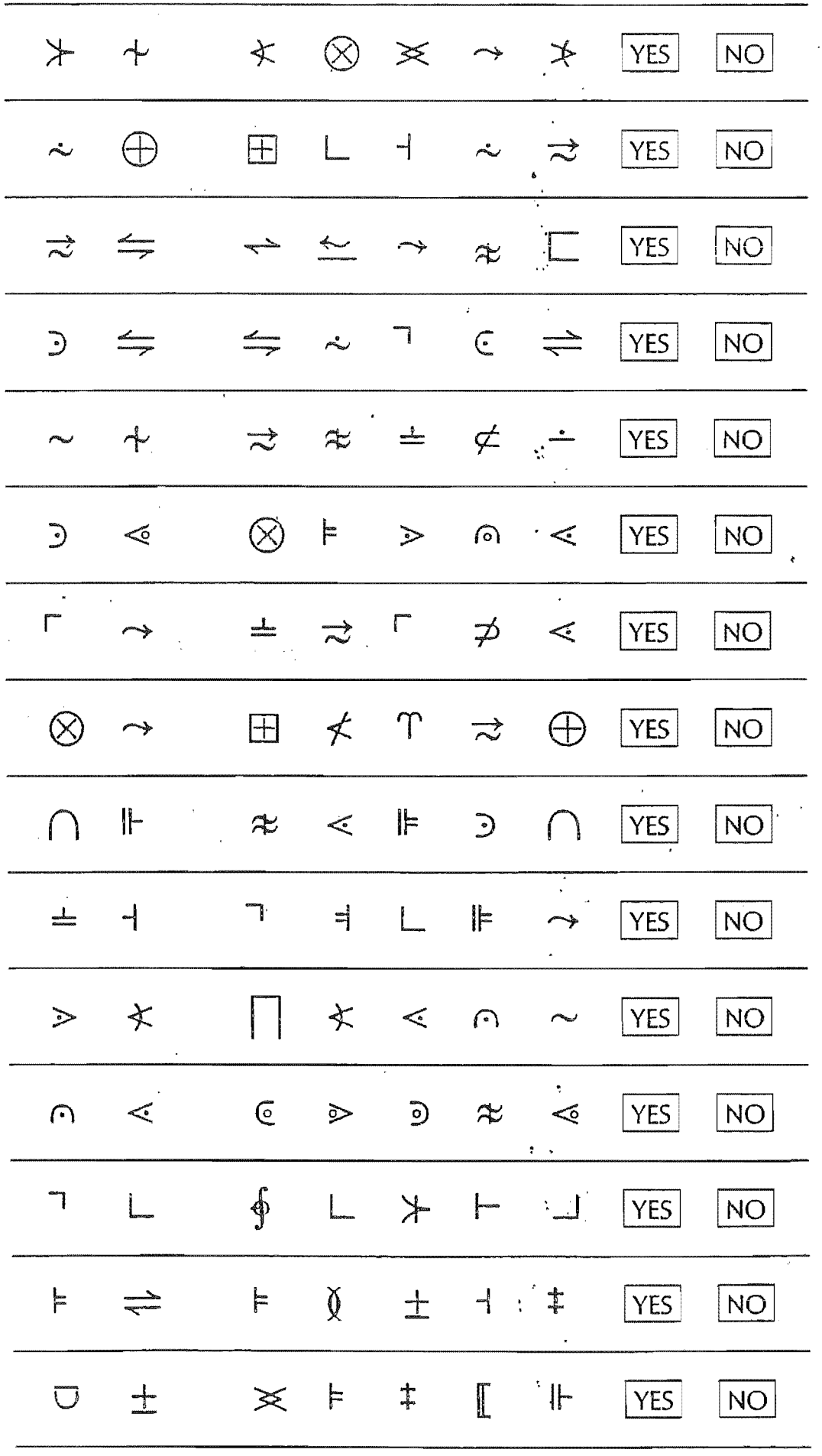
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO

C I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NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO
YES
NO

STOP

RAPID AUTOMATIZED NAMING TASK (RAN)

NAME: _____ DATE: _____

TEST SESSION: _____ EXAMINER: _____

NUMBERS

2 6 9 4 7 6 2 9 7 4

9 4 2 7 4 2 6 7 9 2

6 2 9 6 9 4 7 2 4 6

4 9 7 2 4 9 6 9 2 7

9 6 4 7 6 7 2 6 7 9

OF ERRORS: _____ TOTAL CORRECT: _____

INSERTIONS: _____ TIME (in seconds): _____

SUBSTITUTIONS: _____ # SELF-CORRECTIONS: _____

OMISSIONS: _____

RAPID AUTOMATIZED NAMING TASK (RAN)

NAME: _____ DATE: _____

TEST SESSION: _____ EXAMINER: _____

LETTERS

O A S D P A O S P D

S D A P D O A P S O

A O S A S D P O D A

D S P O D S A S O P

S A D P A P O A P S

OF ERRORS: _____ TOTAL CORRECT: _____

INSERTIONS: _____ TIME (in seconds): _____

SUBSTITUTIONS: _____ # SELF-CORRECTIONS: _____

OMISSIONS: _____

RAPID AUTOMATIZED NAMING TASK (RAN)

NAME: _____ DATE: _____

TEST SESSION: _____ EXAMINER: _____

COLOURS

BLACK RED YELLOW GREEN BLUE RED BLACK YELLOW BLUE GREEN

YELLOW GREEN RED BLUE GREEN BLACK RED BLUE YELLOW BLACK

RED BLACK YELLOW RED YELLOW GREEN BLUE BLACK GREEN RED

GREEN YELLOW BLUE BLACK GREEN YELLOW RED YELLOW BLACK BLUE

YELLOW RED GREEN BLUE RED BLUE BLACK RED BLUE YELLOW

OF ERRORS: _____ TOTAL CORRECT: _____

INSERTIONS: _____ TIME (in seconds): _____

SUBSTITUTIONS: _____ # SELF-CORRECTIONS: _____

OMISSIONS: _____

RAPID AUTOMATIZED NAMING TASK (RAN)

NAME: _____ DATE: _____

TEST SESSION: _____ EXAMINER: _____

OBJECT NAMES

BOOK CHAIR DOG HAND STAR CHAIR BOOK DOG STAR HAND

DOG HAND BOOK STAR HAND BOOK CHAIR STAR DOG BOOK

CHAIR BOOK DOG CHAIR BOOK HAND STAR BOOK HAND CHAIR

HAND DOG STAR BOOK HAND DOG CHAIR DOG BOOK STAR

DOG CHAIR HAND STAR CHAIR STAR DOG CHAIR STAR HAND

OF ERRORS: _____ TOTAL CORRECT: _____

INSERTIONS: _____ TIME (in seconds): _____

SUBSTITUTIONS: _____ # SELF-CORRECTIONS: _____

OMISSIONS: _____

How Fast Can You Go? .... How Quickly Can You Stop?

A research project conducted by *The Hospital for Sick Children* in collaboration with *The Ontario Science Centre* and *The Clarke Institute of Psychiatry*, Summer 1996.

Operation of the Stop Task

Set-Up

1. Type **CD\STOP** and press **ENTER**.
2. Type **BSTOP** and press **ENTER**.
3. Select **RUN TESTS** from the MAIN MENU and press **ENTER**.
4. Type in the **ID** number of the participant and press **ENTER**.
5. Type in [redacted] OSC at the prompt for PROTOCOL FILE and press **ENTER**.
6. Type N (neutral/normal) at the prompt for ORDER and press **ENTER**.
7. Press 3 at the prompt for PAUSE AFTER EVERY __ TRIAL BLOCKS and press **ENTER**.
8. Press **ENTER** to start the Practice blocks.

Practice Blocks

1. After the first practice block is completed, press Y and then **ENTER** to run the second practice.
2. After the second practice block, press N and then **ENTER** to run the test phase.

Scoring

1. Select **SCORE TESTS** from the MAIN MENU, and press **ENTER**.
2. Type in the **ID** number of the participant and press **ENTER** (You may just press **ENTER** if you are scoring the test of the last participant to run the test).

Exiting

1. Select **QUIT STOPSIG** from the MAIN MENU, and press **ENTER**.

Note

1. Press **ESC** key at any time if you need to stop the task. The data will be saved in the*.dat file automatically, however incomplete data files cannot be scored by the computer.
2. If you run into trouble during set-up, check the list of key functions at the bottom of screen.

How Fast Can You Go? .... How Quickly Can You Stop?

A research project conducted by *The Hospital for Sick Children* in collaboration with *The Ontario Science Centre* and *The Clarke Institute of Psychiatry*, Summer 1996.

Stop Task Instructions

for participants

[redacted]

Before Practice Phase 1

-We are going to divide our session into three phases- 2 practice sessions, followed by the actual task.
-This is your control box. This is the X button, and this is the O button.
-When we start the task, you will see a fixation point on the screen followed by either an X or an O.
-Your job is to respond to the letter on the screen as quickly as you can by pushing the corresponding button on the box.
-Use your thumbs to push the X and O buttons.
-As soon as you see the letter, push the button as quickly as you can.
-Go as fast as you can without making mistakes.
-Every once in a while you will hear a beep [redacted]
- Ignore the beep for now.
-Are you ready for the first practice phase?

Before Practice Phase 2

-The task is exactly the same for this practice, however, when you hear the beep try to stop yourself from pressing the button.
-You will see a letter on the screen, but don't press the button if you hear the beep.
-Sometimes the computer will make it impossible to stop, but sometimes it will be easy for you to stop.
-Just try to stop as often as you can.
-You will not be able to predict when a beep will come, and they won't come too often, so remember to keep pressing the appropriate button as fast as you can when the letters come up on the screen.
-Alright, we are going to start the second practice phase now.
-Do you have any questions before we start?

Before Test Phase

-Alright, we are going to start the actual task, this part will take about 15 minutes.
-Remember to keep pressing the appropriate button as fast as you can when the letters come up on the screen, and to try to stop yourself from pressing a button if you hear a beep.
- OPTIONAL -Before we get started, I want you to remember to ....(give appropriate instructions to account for any strategy you notice the individual using).
-Do you have any questions before we start the actual task?

or - but monitor once or twice

mean NO STOP - how fast you are going over 8 trials

mean STOP TONE - how fast you are able to stop

2 min | 6 min | 6 min | 4 min

test

Stroop Task

Score Page 1

1	RED	GREEN	BLUE	GREEN	RED
2	BLUE	BLUE	GREEN	RED	GREEN
3	RED	GREEN	RED	BLUE	RED
4	GREEN	RED	GREEN	RED	BLUE
5	BLUE	BLUE	BLUE	GREEN	GREEN
6	RED	GREEN	RED	BLUE	BLUE
7	BLUE	RED	GREEN	RED	RED
8	GREEN	BLUE	BLUE	GREEN	GREEN
9	BLUE	RED	RED	BLUE	BLUE
10	RED	BLUE	BLUE	RED	RED
11	GREEN	GREEN	RED	BLUE	GREEN
12	BLUE	RED	GREEN	GREEN	BLUE
13	GREEN	BLUE	BLUE	BLUE	GREEN
14	BLUE	GREEN	RED	RED	RED
15	RED	BLUE	BLUE	BLUE	BLUE
16	BLUE	GREEN	RED	GREEN	GREEN
17	GREEN	BLUE	GREEN	BLUE	RED
18	RED	GREEN	RED	RED	BLUE
19	BLUE	BLUE	BLUE	GREEN	RED
20	RED	RED	GREEN	BLUE	BLUE

1	GREEN	RED	GREEN	RED	GREEN
2	RED	GREEN	BLUE	BLUE	BLUE
3	BLUE	RED	GREEN	RED	GREEN
4	RED	BLUE	BLUE	GREEN	RED
5	GREEN	GREEN	RED	BLUE	BLUE
6	BLUE	RED	GREEN	RED	RED
7	GREEN	BLUE	BLUE	GREEN	GREEN
8	BLUE	GREEN	RED	BLUE	BLUE
9	RED	BLUE	GREEN	RED	RED
10	BLUE	GREEN	RED	GREEN	GREEN
11	RED	RED	GREEN	RED	RED
12	GREEN	BLUE	BLUE	BLUE	GREEN
13	BLUE	GREEN	RED	GREEN	RED
14	RED	BLUE	GREEN	BLUE	BLUE
15	BLUE	GREEN	RED	RED	GREEN
16	GREEN	RED	GREEN	BLUE	RED
17	RED	GREEN	RED	RED	BLUE
18	BLUE	BLUE	BLUE	GREEN	GREEN
19	RED	RED	GREEN	BLUE	BLUE
20	BLUE	GREEN	RED	RED	GREEN

1	GREEN	RED	GREEN	RED	GREEN
2	RED	GREEN	BLUE	BLUE	BLUE
3	BLUE	RED	GREEN	RED	GREEN
4	RED	BLUE	BLUE	GREEN	RED
5	GREEN	GREEN	RED	BLUE	BLUE
6	BLUE	RED	GREEN	RED	RED
7	GREEN	BLUE	BLUE	GREEN	GREEN
8	BLUE	GREEN	RED	BLUE	BLUE
9	RED	BLUE	GREEN	RED	RED
10	BLUE	GREEN	RED	GREEN	GREEN
11	RED	RED	GREEN	RED	RED
12	GREEN	BLUE	BLUE	BLUE	GREEN
13	BLUE	GREEN	RED	GREEN	RED
14	RED	BLUE	GREEN	BLUE	BLUE
15	BLUE	GREEN	RED	RED	GREEN
16	GREEN	RED	GREEN	BLUE	RED
17	RED	GREEN	RED	RED	BLUE
18	BLUE	BLUE	BLUE	GREEN	GREEN
19	RED	RED	GREEN	BLUE	BLUE
20	BLUE	GREEN	RED	RED	GREEN

Stroop Negative Priming

GREEN

PURPLE

BLACK

RED

WHITE

GRAY

PINK

YELLOW

BLUE

BROWN

ORANGE

Tower of London

3 MOVE PROBLEMS

SCORING: If the child solves the problem (MPS) on trials

1 & 2 the score = 4
2 & 3 the score = 3
1 & 3 the score = 2
on any single trial = 1
no MPS = 0

PROBLEM 3.1

S:
s
m | 1
1 2 3

G:
s
m
1
1 2 3

TRIAL	1ST MOVE CFM			RT	MPS N Y
1	1 S12	2 S13	3 L32		0 1
2	1 S12	2 S13	3 L32		0 1
3	1 S12	2 S13	3 L32		0 1

TOTAL SCORE _____

PROBLEM 3.2

S:
s
l m |
1 2 3

G:
s
m
l
1 2 3

TRIAL	1ST MOVE CFM			RT	MPS N Y
1	1 S13	2 S12	3 M23		0 1
2	1 S13	2 S12	3 M23		0 1
3	1 S13	2 S12	3 M23		0 1

TOTAL SCORE _____

Total Overall Score_____

5 MOVE PROBLEMS

SCORING: If the child solves the problem (MPS) on trials

1 & 2 the score = 4
2 & 3 the score = 3
1 & 3 the score = 2
on any single trial = 1
no MPS = 0

PROBLEM 5.1

S:

s	m	l
1	2	3

G:

		s
		m
		l
1	2	3

TRIAL	1ST MOVE CFM			RT	MPS N	MPS Y
1	1 S31	2 S32	3 M12		0	1
2	1 S31	2 S32	3 M12		0	1
3	1 S31	2 S32	3 M12		0	1

TOTAL SCORE _____

PROBLEM 5.2

S:

		s
	m	l
1	2	3

G:

s		
m		
l		
1	2	3

TRIAL	1ST MOVE CFM			RT	MPS N	MPS Y
1	1 S32	2 S31	3 M21		0	1
2	1 S32	2 S31	3 M21		0	1
3	1 S32	2 S31	3 M21		0	1

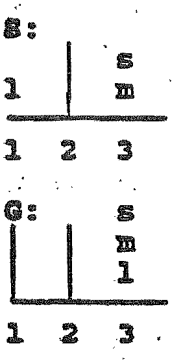
TOTAL SCORE _____

7 MOVE PROBLEMS

SCORING: If the child solves the problem (MPS) on trials

1 & 2 the score = 4
2 & 3 the score = 3
1 & 3 the score = 2
on any single trial = 1
no MPS = 0

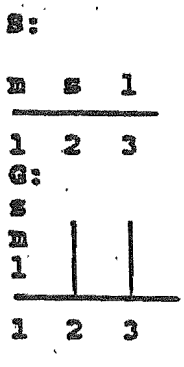
PROBLEM 7.1



TRIAL	1ST MOVE CFM			RT	MPS N Y
1	1 S31	2 S32	3 L12		0 1
2	1 S31	2 S32	3 L12		0 1
3	1 S31	2 S32	3 L12		0 1

TOTAL SCORE _____

PROBLEM 7.2



TRIAL	1ST MOVE CFM			RT	MPS N Y
1	1 S23	2 S21	3 M13		0 1
2	1 S23	2 S21	3 M13		0 1
3	1 S23	2 S21	3 M13		0 1

TOTAL SCORE _____

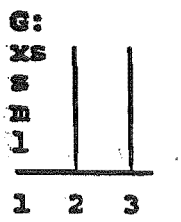
11 MOVE PROBLEMS

SCORING: If the child solves the problem (MPS) on trials

1 & 2 the score = 4
2 & 3 the score = 3
1 & 3 the score = 2
on any single trial = 1
no MPS = 0

PROBLEM 11.1

S:



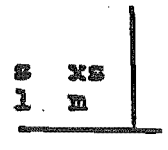
G:

TRIAL	1ST MOVE			RT	MPS
	CFM				N Y
1	1 XS13	2 XS12	3 M23		0 1
2	1 XS13	2 XS12	3 M23		0 1
3	1 XS13	2 XS12	3 M23		0 1

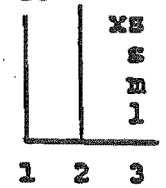
TOTAL SCORE _____

PROBLEM 11.2

S:



G:



TRIAL	1ST MOVE			RT	MPS
	CFM				N Y
1	1 XS23	2 XS21	3 S13		0 1
2	1 XS23	2 XS21	3 S13		0 1
3	1 XS23	2 XS21	3 S13		0 1

TOTAL SCORE _____

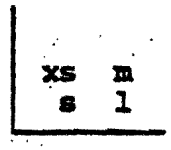
15 MOVE PROBLEMS

SCORING: If the child solves the problem (MPS) on trials

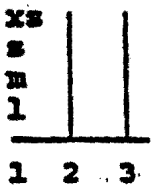
1 & 2 the score = 4
2 & 3 the score = 3
1 & 3 the score = 2
on any single trial = 1
no MPS = 0

PROBLEM 15.1 — TRIAL — 1ST MOVE CFM — RT — MPS N Y

S:



G:

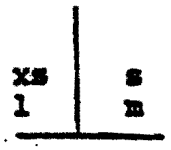


1	1 XS23	2 XS21	3 M31		0 1
2	1 XS23	2 XS21	3 M31		0 1
3	1 XS23	2 XS21	3 M31		0 1

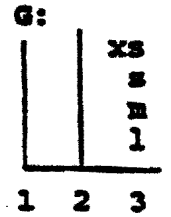
TOTAL SCORE _____

PROBLEM 15.2 — TRIAL — 1ST MOVE CFM — RT — MPS N Y

S:



G:



1	1 XS12	2 XS13	3 S32		0 1
2	1 XS12	2 XS13	3 S32		0 1
3	1 XS12	2 XS13	3 S32		0 1

TOTAL SCORE _____

Rosenberg Self-Esteem Scale

Please check the appropriate answer per item, depending on whether you strongly agree, agree, disagree, or strongly disagree with it.

		strongly agree	agree	disagree	strongly disagree
1	On the whole, I am satisfied with myself.				
2	At times I think I am no good at all.				
3	I feel that I have a number of good qualities.				
4	I am able to do things as well as most other people.				
5	I feel I do not have much to be proud of.				
6	I certainly feel useless at times.				
7	I feel I am a person of worth, at least on an equal plane with others.				
8	I wish I could have more respect for myself.				
9	All in all, I am inclined to feel I am a failure.				
10	I take a positive attitude toward myself.				

"WHAT I THINK AND FEEL"

(RCMAS)

Cecil R. Reynolds, Ph.D. and Bert O. Richmond, Ed.D.

Name: _____ Today's Date: _____

Age: _____ Sex (circle one): Girl Boy Grade: _____

School: _____ Teacher's Name (Optional): _____

DIRECTIONS

Here are some sentences that tell how some people think and feel about themselves. Read each sentence carefully. Circle the word "Yes" if you think it is true about you. Circle the word "No" if you think it is *not* true about you. Answer every question even if some are hard to decide. Do not circle both "Yes" and "No" for the same sentence.

There are no right or wrong answers. Only you can tell us how you think and feel about yourself. Remember, after you read each sentence, ask yourself "Is it true about me?" If it is, circle "Yes." If it is not, circle "No."

	Raw Score	Percentile	*T*-Score or Scaled Score
Total:	_____	_____	_____
I:	_____	_____	_____
II:	_____	_____	_____
III:	_____	_____	_____
L:	_____	_____	_____

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1. I have trouble making up my mind	Yes	No
2. I get nervous when things do not go the right way for me	Yes	No
3. Others seem to do things easier than I can	Yes	No
4. I like everyone I know	Yes	No
5. Often I have trouble getting my breath	Yes	No
6. I worry a lot of the time	Yes	No
7. I am afraid of a lot of things	Yes	No
8. I am always kind	Yes	No
9. I get mad easily	Yes	No
10. I worry about what my parents will say to me	Yes	No
11. I feel that others do not like the way I do things	Yes	No
12. I always have good manners	Yes	No
13. It is hard for me to get to sleep at night	Yes	No
14. I worry about what other people think about me	Yes	No
15. I feel alone even when there are people with me	Yes	No
16. I am always good	Yes	No
17. Often I feel sick in my stomach	Yes	No
18. My feelings get hurt easily	Yes	No
19. My hands feel sweaty	Yes	No
20. I am always nice to everyone	Yes	No
21. I am tired a lot	Yes	No
22. I worry about what is going to happen	Yes	No
23. Other people are happier than I	Yes	No
24. I tell the truth every single time	Yes	No
25. I have bad dreams	Yes	No
26. My feelings get hurt easily when I am fussed at	Yes	No
27. I feel someone will tell me I do things the wrong way	Yes	No
28. I never get angry	Yes	No
29. I wake up scared some of the time	Yes	No
30. I worry when I go to bed at night	Yes	No
31. It is hard for me to keep my mind on my schoolwork	Yes	No
32. I never say things I shouldn't	Yes	No
33. I wiggle in my seat a lot	Yes	No
34. I am nervous	Yes	No
35. A lot of people are against me	Yes	No
36. I never lie	Yes	No
37. I often worry about something bad happening to me	Yes	No

Name: _____ Age: _____ Birthdate: _____
Grade in school: _____ Sex: _____ Today's date: _____

CDI

Maria Kovacs, Ph.D.

Kids sometimes have different feelings and ideas.

This form lists the feelings and ideas in groups. From each group of three sentences, pick one sentence that describes you ***best*** for the past two weeks. After you pick a sentence from the first group, go on to the next group.

There is no right answer or wrong answer. Just pick the sentence that best describes the way you have been recently. Put a mark like this ☒ next to your answer. Put the mark in the box next to the sentence that you pick.

Here is an example of how this form works. Try it. Put a mark next to the sentence that describes you ***best***.

Example:

☐ I read books all the time.
☐ I read books once in a while.
☐ I never read books.

When you are told to do so, tear off this top page. Then, pick the sentences that describe you best on the first page. After you finish the first page, turn to the back. Then, answer the items on that page.

Remember, pick out the sentences that describe you best in the PAST TWO WEEKS.

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CDI

Item 1

- ☐ I am sad once in a while.
- ☐ I am sad many times.
- ☐ I am sad all the time.

Item 2

- ☐ Nothing will ever work out for me.
- ☐ I am not sure if things will work out for me.
- ☐ Things will work out for me O.K.

Item 3

- ☐ I do most things O.K.
- ☐ I do many things wrong.
- ☐ I do everything wrong.

Item 4

- ☐ I have fun in many things.
- ☐ I have fun in some things.
- ☐ Nothing is fun at all.

Item 5

- ☐ I am bad all the time.
- ☐ I am bad many times.
- ☐ I am bad once in a while.

Item 6

- ☐ I think about bad things happening to me once in a while.
- ☐ I worry that bad things will happen to me.
- ☐ I am sure that terrible things will happen to me.

Item 7

- ☐ I hate myself.
- ☐ I do not like myself.
- ☐ I like myself.

Item 8

- ☐ All bad things are my fault.
- ☐ Many bad things are my fault.
- ☐ Bad things are not usually my fault.

Item 9

- ☐ I do not think about killing myself.
- ☐ I think about killing myself but I would not do it.
- ☐ I want to kill myself.

Item 10

- ☐ I feel like crying every day.
- ☐ I feel like crying many days.
- ☐ I feel like crying once in a while.

Item 11

- ☐ Things bother me all the time.
- ☐ Things bother me many times.
- ☐ Things bother me once in a while.

Item 12

- ☐ I like being with people.
- ☐ I do not like being with people many times.
- ☐ I do not want to be with people at all.

Item 13

- ☐ I cannot make up my mind about things.
- ☐ It is hard to make up my mind about things.
- ☐ I make up my mind about things easily.

Item 14

- ☐ I look O.K.
- ☐ There are some bad things about my looks.
- ☐ I look ugly.

Remember to fill out the other side

CDI

Remember, describe how you have been in the past two weeks.....

Item 15

- ☐ I have to push myself all the time to do my schoolwork.
- ☐ I have to push myself many times to do my schoolwork.
- ☐ Doing schoolwork is not a big problem.

Item 16

- ☐ I have trouble sleeping every night.
- ☐ I have trouble sleeping many nights.
- ☐ I sleep pretty well.

Item 17

- ☐ I am tired once in a while.
- ☐ I am tired many days.
- ☐ I am tired all the time.

Item 18

- ☐ Most days I do not feel like eating.
- ☐ Many days I do not feel like eating.
- ☐ I eat pretty well.

Item 19

- ☐ I do not worry about aches and pains.
- ☐ I worry about aches and pains many times.
- ☐ I worry about aches and pains all the time.

Item 20

- ☐ I do not feel alone.
- ☐ I feel alone many times.
- ☐ I feel alone all the time.

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Item 21

- ☐ I never have fun at school.
- ☐ I have fun at school only once in a while.
- ☐ I have fun at school many times.

Item 22

- ☐ I have plenty of friends.
- ☐ I have some friends but I wish I had more.
- ☐ I do not have any friends.

Item 23

- ☐ My schoolwork is alright.
- ☐ My schoolwork is not as good as before.
- ☐ I do very badly in subjects I used to be good in

Item 24

- ☐ I can never be as good as other kids.
- ☐ I can be as good as other kids if I want to.
- ☐ I am just as good as other kids.

Item 25

- ☐ Nobody really loves me.
- ☐ I am not sure if anybody loves me.
- ☐ I am sure that somebody loves me.

Item 26

- ☐ I usually do what I am told.
- ☐ I do not do what I am told most times.
- ☐ I never do what I am told.

Item 27

- ☐ I get along with people.
- ☐ I get into fights many times.
- ☐ I get into fights all the time.

MHS

Remember to fill out the other side

APPENDIX 2

1. Conners' Parent Rating Scale – Revised
2. Child Behavior Checklist
3. Junior Temperament and Character Inventory – Parent Version
4. Family Environment Scale
5. Parent version of the Kastan Children's Attributional Style Questionnaire
6. The New Zealand Socioeconomic Index of Occupational Status

Conners' Parent Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

Child's Name:_____ Gender: M F
(Circle One)

Birthdate:_____/_____/_____ Age:_____ School Grade:_____
Month Day Year

Parent's Name:_____ Today's Date:_____/_____/_____
Month Day Year

Instructions: Below are a number of common problems that children have. Please rate each item according to your child's behavior in the last month. For each item, ask yourself "How much of a problem has this been in the last month?", and circle the best answer for each one. If none, not at all, seldom, or very infrequently, you would circle 0. If very much true, or it occurs very often or frequently, you would circle 3. You would circle 1 or 2 for ratings in between. Please respond to all the items.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
1. Angry and resentful	0	1	2	3
2. Difficulty doing or completing homework	0	1	2	3
3. Is always "on the go" or acts as if driven by a motor	0	1	2	3
4. Timid, easily frightened	0	1	2	3
5. Everything must be just so	0	1	2	3
6. Has no friends	0	1	2	3
7. Stomach aches	0	1	2	3
8. Fights	0	1	2	3
9. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)	0	1	2	3
10. Has difficulty sustaining attention in tasks or play activities	0	1	2	3
11. Argues with adults	0	1	2	3
12. Fails to complete assignments	0	1	2	3
13. Hard to control in malls or while grocery shopping	0	1	2	3
14. Afraid of people	0	1	2	3
15. Keeps checking things over again and again	0	1	2	3
16. Loses friends quickly	0	1	2	3
17. Aches and pains	0	1	2	3
18. Restless or overactive	0	1	2	3
19. Has trouble concentrating in class	0	1	2	3
20. Does not seem to listen to what is being said to him/her	0	1	2	3
21. Loses temper	0	1	2	3
22. Needs close supervision to get through assignments	0	1	2	3
23. Runs about or climbs excessively in situations where it is inappropriate	0	1	2	3
24. Afraid of new situations	0	1	2	3
25. Fussy about cleanliness	0	1	2	3
26. Does not know how to make friends	0	1	2	3
27. Gets aches and pains or stomachaches before school	0	1	2	3
28. Excitable, impulsive	0	1	2	3
29. Does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behavior or failure to understand instructions)	0	1	2	3
30. Has difficulty organizing tasks and activities	0	1	2	3
31. Irritable	0	1	2	3
32. Restless in the "squirmy sense"	0	1	2	3
33. Afraid of being alone	0	1	2	3
34. Things must be done the same way every time	0	1	2	3
35. Does not get invited over to friends' houses	0	1	2	3
36. Headaches	0	1	2	3
37. Fails to finish things he/she starts	0	1	2	3

Items continued on back page...

Conners' Parent Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequen
38. Inattentive, easily distracted	0	1	2	3
39. Talks excessively	0	1	2	3
40. Actively defies or refuses to comply with adults' requests	0	1	2	3
41. Fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities	0	1	2	3
42. Has difficulty waiting in lines or awaiting turn in games or group situations	0	1	2	3
43. Has a lot of fears	0	1	2	3
44. Has rituals that he/she must go through	0	1	2	3
45. Distractibility or attention span a problem	0	1	2	3
46. Complains about being sick even when nothing is wrong	0	1	2	3
47. Temper outbursts	0	1	2	3
48. Gets distracted when given instructions to do something	0	1	2	3
49. Interrupts or intrudes on others (e.g., butts into others' conversations or games)	0	1	2	3
50. Forgetful in daily activities	0	1	2	3
51. Cannot grasp arithmetic	0	1	2	3
52. Will run around between mouthfuls at meals	0	1	2	3
53. Afraid of the dark, animals, or bugs	0	1	2	3
54. Sets very high goals for self	0	1	2	3
55. Fidgets with hands or feet or squirms in seat	0	1	2	3
56. Short attention span	0	1	2	3
57. Touchy or easily annoyed by others	0	1	2	3
58. Has sloppy handwriting	0	1	2	3
59. Has difficulty playing or engaging in leisure activities quietly	0	1	2	3
60. Shy, withdrawn	0	1	2	3
61. Blames others for his/her mistakes or misbehavior	0	1	2	3
62. Fidgeting	0	1	2	3
63. Messy or disorganized at home or school	0	1	2	3
64. Gets upset if someone rearranges his/her things	0	1	2	3
65. Clings to parents or other adults	0	1	2	3
66. Disturbs other children	0	1	2	3
67. Deliberately does things that annoy other people	0	1	2	3
68. Demands must be met immediately — easily frustrated	0	1	2	3
69. Only attends if it is something he/she is very interested in	0	1	2	3
70. Spiteful or vindictive	0	1	2	3
71. Loses things necessary for tasks or activities (e.g., school assignments, pencils, books, tools or toys)	0	1	2	3
72. Feels inferior to others	0	1	2	3
73. Seems tired or slowed down all the time	0	1	2	3
74. Spelling is poor	0	1	2	3
75. Cries often and easily	0	1	2	3
76. Leaves seat in classroom or in other situations in which remaining seated is expected	0	1	2	3
77. Mood changes quickly and drastically	0	1	2	3
78. Easily frustrated in efforts	0	1	2	3
79. Easily distracted by extraneous stimuli	0	1	2	3
80. Blurts out answers to questions before the questions have been completed	0	1	2	3

CHILD BEHAVIOR CHECKLIST FOR AGES 4–18

Please Print

For office use only
ID #

CHILD'S FULL NAME: FIRST MIDDLE LAST

SEX: ☐ Boy ☐ Girl

AGE

ETHNIC GROUP OR RACE

TODAY'S DATE: Mo. _____ Date _____ Yr. _____

CHILD'S BIRTHDATE: Mo. _____ Date _____ Yr. _____

GRADE IN SCHOOL _____

NOT ATTENDING SCHOOL ☐

Please fill out this form to reflect *your* view of the child's behavior even if other people might not agree. Feel free to print additional comments beside each item and in the spaces provided on page 2.

PARENTS' USUAL TYPE OF WORK, even if not working now. *(Please be specific—for example, auto mechanic, high school teacher, homemaker, laborer, lathe operator, shoe salesman, army sergeant.)*

FATHER'S TYPE OF WORK: _____

MOTHER'S TYPE OF WORK: _____

THIS FORM FILLED OUT BY:

☐ Mother (full name) _____

☐ Father (full name) _____

☐ Other—full name & relationship to child: _____

I. Please list the sports your child most likes to take part in. For example: swimming, baseball, skating, skate boarding, bike riding, fishing, etc.

☐ None

a. _____

b. _____

c. _____

Compared to others of the same age, about how much time does he/she spend in each?

	Don't Know	Less Than Average	Average	More Than Average
a.	☐	☐	☐	☐
b.	☐	☐	☐	☐
c.	☐	☐	☐	☐

Compared to others of the same age, how well does he/she do each one?

	Don't Know	Below Average	Average	Above Average
a.	☐	☐	☐	☐
b.	☐	☐	☐	☐
c.	☐	☐	☐	☐

II. Please list your child's favorite hobbies, activities, and games, other than sports. For example: stamps, dolls, books, piano, crafts, cars, singing, etc. (Do ***not*** include listening to radio or TV.)

☐ None

a. _____

b. _____

c. _____

Compared to others of the same age, about how much time does he/she spend in each?

	Don't Know	Less Than Average	Average	More Than Average
a.	☐	☐	☐	☐
b.	☐	☐	☐	☐
c.	☐	☐	☐	☐

Compared to others of the same age, how well does he/she do each one?

	Don't Know	Below Average	Average	Above Average
a.	☐	☐	☐	☐
b.	☐	☐	☐	☐
c.	☐	☐	☐	☐

III. Please list any organizations, clubs, teams, or groups your child belongs to.

☐ None

a. _____

b. _____

c. _____

Compared to others of the same age, how active is he/she in each?

	Don't Know	Less Active	Average	More Active
a.	☐	☐	☐	☐
b.	☐	☐	☐	☐
c.	☐	☐	☐	☐

IV. Please list any jobs or chores your child has. For example: paper route, babysitting, making bed, working in store, etc. (Include ***both*** paid and unpaid jobs and chores.)

☐ None

a. _____

b. _____

c. _____

Compared to others of the same age, how well does he/she carry them out?

	Don't Know	Below Average	Average	Above Average
a.	☐	☐	☐	☐
b.	☐	☐	☐	☐
c.	☐	☐	☐	☐

4-95 Edition

Please Print

V. 1. About how many close friends does your child have? ☐ None ☐ 1 ☐ 2 or 3 ☐ 4 or more
(Do *not* include brothers & sisters)

2. About how many times a week does your child do things with any friends outside of regular school hours?
(Do *not* include brothers & sisters) ☐ Less than 1 ☐ 1 or 2 ☐ 3 or more

VI. Compared to others of his/her age, how well does your child:

	Worse	About Average	Better	
a. Get along with his/her brothers & sisters?	☐	☐	☐	☐ Has no brothers or sisters
b. Get along with other kids?	☐	☐	☐	
c. Behave with his/her parents?	☐	☐	☐	
d. Play and work alone?	☐	☐	☐	

VII. 1. For ages 6 and older—performance in academic subjects. ☐ Does not attend school because _____

Check a box for each subject that child takes	Failing	Below Average	Average	Above Average
a. Reading, English, or Language Arts	☐	☐	☐	☐
b. History or Social Studies	☐	☐	☐	☐
c. Arithmetic or Math	☐	☐	☐	☐
d. Science	☐	☐	☐	☐
Other academic subjects—for example, computer courses, foreign language, business. (Do *not* include gym, shop, driver's ed., etc.) e. _____	☐	☐	☐	☐
f. _____	☐	☐	☐	☐
g. _____	☐	☐	☐	☐

2. Does your child receive special remedial services or attend a special class or special school? ☐ No ☐ Yes—kind of services, class, or school:

3. Has your child repeated any grades? ☐ No ☐ Yes—grades and reasons:

4. Has your child had any academic or other problems in school? ☐ No ☐ Yes—please describe:

When did these problems start?

Have these problems ended? ☐ No ☐ Yes—when?

Does your child have any illness or disability (either physical or mental)? ☐ No ☐ Yes—please describe:

What concerns you most about your child?

Please describe the best things about your child:

Below is a list of items that describe children and youth. For each item that describes your child ***now or within the past 6 months***, please circle the *2* if the item is ***very true or often true*** of your child. Circle the *1* if the item is ***somewhat or sometimes true*** of your child. If the item is ***not true*** of your child, circle the *0*. Please answer all items as well as you can, even if some do not seem to apply to your child.

Please Print

0 = Not True (as far as you know) 1 = Somewhat or Sometimes True 2 = Very True or Often True

0 1 2 1. Acts too young for his/her age
0 1 2 2. Allergy (describe): _____
_____
0 1 2 3. Argues a lot
0 1 2 4. Asthma
0 1 2 5. Behaves like opposite sex
0 1 2 6. Bowel movements outside toilet
0 1 2 7. Bragging, boasting
0 1 2 8. Can't concentrate, can't pay attention for long
0 1 2 9. Can't get his/her mind off certain thoughts; obsessions (describe): _____
_____
0 1 2 10. Can't sit still, restless, or hyperactive
0 1 2 11. Clings to adults or too dependent
0 1 2 12. Complains of loneliness
0 1 2 13. Confused or seems to be in a fog
0 1 2 14. Cries a lot
0 1 2 15. Cruel to animals
0 1 2 16. Cruelty, bullying, or meanness to others
0 1 2 17. Day-dreams or gets lost in his/her thoughts
0 1 2 18. Deliberately harms self or attempts suicide
0 1 2 19. Demands a lot of attention
0 1 2 20. Destroys his/her own things
0 1 2 21. Destroys things belonging to his/her family or others
0 1 2 22. Disobedient at home
0 1 2 23. Disobedient at school
0 1 2 24. Doesn't eat well
0 1 2 25. Doesn't get along with other kids
0 1 2 26. Doesn't seem to feel guilty after misbehaving
0 1 2 27. Easily jealous
0 1 2 28. Eats or drinks things that are not food—*don't* include sweets (describe): _____
_____
0 1 2 29. Fears certain animals, situations, or places, other than school (describe): _____
_____
0 1 2 30. Fears going to school
0 1 2 31. Fears he/she might think or do something bad
0 1 2 32. Feels he/she has to be perfect
0 1 2 33. Feels or complains that no one loves him/her
0 1 2 34. Feels others are out to get him/her
0 1 2 35. Feels worthless or inferior
0 1 2 36. Gets hurt a lot, accident-prone
0 1 2 37. Gets in many fights
0 1 2 38. Gets teased a lot
0 1 2 39. Hangs around with others who get in trouble
0 1 2 40. Hears sounds or voices that aren't there (describe): _____
_____
0 1 2 41. Impulsive or acts without thinking
0 1 2 42. Would rather be alone than with others
0 1 2 43. Lying or cheating
0 1 2 44. Bites fingernails
0 1 2 45. Nervous, highstrung, or tense
0 1 2 46. Nervous movements or twitching (describe): _____
_____
0 1 2 47. Nightmares
0 1 2 48. Not liked by other kids
0 1 2 49. Constipated, doesn't move bowels
0 1 2 50. Too fearful or anxious
0 1 2 51. Feels dizzy
0 1 2 52. Feels too guilty
0 1 2 53. Overeating
0 1 2 54. Overtired
0 1 2 55. Overweight
56. Physical problems ***without known medical cause:***
0 1 2 a. Aches or pains (***not*** stomach or headaches)
0 1 2 b. Headaches
0 1 2 c. Nausea, feels sick
0 1 2 d. Problems with eyes (***not*** if corrected by glasses) (describe): _____
0 1 2 e. Rashes or other skin problems
0 1 2 f. Stomachaches or cramps
0 1 2 g. Vomiting, throwing up
0 1 2 h. Other (describe): _____
_____

Please see other side

Please Print

0 = Not True (as far as you know) 1 = Somewhat or Sometimes True 2 = Very True or Often True

0 1 2 57. Physically attacks people
0 1 2 58. Picks nose, skin, or other parts of body (describe): _____
0 1 2 59. Plays with own sex parts in public
0 1 2 60. Plays with own sex parts too much
0 1 2 61. Poor school work
0 1 2 62. Poorly coordinated or clumsy
0 1 2 63. Prefers being with older kids
0 1 2 64. Prefers being with younger kids
0 1 2 65. Refuses to talk
0 1 2 66. Repeats certain acts over and over; compulsions (describe): _____
0 1 2 67. Runs away from home
0 1 2 68. Screams a lot
0 1 2 69. Secretive, keeps things to self
0 1 2 70. Sees things that aren't there (describe):
0 1 2 71. Self-conscious or easily embarrassed
0 1 2 72. Sets fires
0 1 2 73. Sexual problems (describe): _____
0 1 2 74. Showing off or clowning
0 1 2 75. Shy or timid
0 1 2 76. Sleeps less than most kids
0 1 2 77. Sleeps more than most kids during day and/or night (describe): _____
0 1 2 78. Smears or plays with bowel movements
0 1 2 79. Speech problem (describe): _____
0 1 2 80. Stares blankly
0 1 2 81. Steals at home
0 1 2 82. Steals outside the home
0 1 2 83. Stores up things he/she doesn't need (describe): _____
0 1 2 84. Strange behavior (describe): _____
0 1 2 85. Strange ideas (describe): _____
0 1 2 86. Stubborn, sullen, or irritable
0 1 2 87. Sudden changes in mood or feelings
0 1 2 88. Sulks a lot
0 1 2 89. Suspicious
0 1 2 90. Swearing or obscene language
0 1 2 91. Talks about killing self
0 1 2 92. Talks or walks in sleep (describe): _____
0 1 2 93. Talks too much
0 1 2 94. Teases a lot
0 1 2 95. Temper tantrums or hot temper
0 1 2 96. Thinks about sex too much
0 1 2 97. Threatens people
0 1 2 98. Thumb-sucking
0 1 2 99. Too concerned with neatness or cleanliness
0 1 2 100. Trouble sleeping (describe): _____
0 1 2 101. Truancy, skips school
0 1 2 102. Underactive, slow moving, or lacks energy
0 1 2 103. Unhappy, sad, or depressed
0 1 2 104. Unusually loud
0 1 2 105. Uses alcohol or drugs for nonmedical purposes (describe): _____
0 1 2 106. Vandalism
0 1 2 107. Wets self during the day
0 1 2 108. Wets the bed
0 1 2 109. Whining
0 1 2 110. Wishes to be of opposite sex
0 1 2 111. Withdrawn, doesn't get involved with others
0 1 2 112. Worries
113. Please write in any problems your child ha that were not listed above:
0 1 2 _____
0 1 2 _____
0 1 2 _____

PLEASE BE SURE YOU HAVE ANSWERED ALL ITEMS.

UNDERLINE ANY YOU ARE CONCERNED ABOU

Junior Temperament and Character Inventory
Parent Version

In this questionnaire you will find statements people might use to describe their attitudes, opinions, interests, and other personal feelings.

Each statement can be answered TRUE or FALSE. Read the statement and decide which choice best fits the child you are describing in this questionnaire. Try to describe the person the way they USUALLY or generally act and feel, not just how they are feeling right now.

We would like you to fill out this questionnaire on your own. When you are finished, please return the questionnaire.

HOW TO FILL OUT THIS QUESTIONNAIRE

To answer, you only need to circle either "T" or "F" after each question. Here is an example:

EXAMPLE	TRUE	FALSE
I understand how to fill out this questionnaire	T	F

If you understand how to fill out this questionnaire, circle "T" to show that the statement is TRUE.

Read each statement carefully, but don't spend too much time deciding on the answer.

Please answer every statement, even if you are not completely sure of the answer.

Remember there are no right or wrong answers -- just try to describe as accurately as you can behaviors, opinions, and feelings of the person you are describing in this questionnaire.

Your Name _____ Age _____
Date of birth ____/_____/_____
Day month year

Black ____ White____ Hispanic ____ Other _____
Sex: M F

Occupation _____
Date _____

Name of person filling in the questionnaire _____
Relationship to child participating in the study_____

Please state whether the following are True or False:

1. My child has less energy and gets tired more quickly than most children.

T

F

2. My child can usually accept other kids as they are, even when they are different from him/her.

T

F

3. My child loses his/her temper more easily than other children.

T

F

4. My child doesn't seem to understand the benefits of setting goals.

T

F

5. My child usually tries to get even when someone hurts him/her.

T

F

6. My child tries harder than other children in school (spends more time on homework, practicing sports or instrument, etc.)

T

F

7. My child often needs naps or extra rest periods because he/she gets tired easily.

T

F

8. Even when my child has plenty of money, he/she would rather save it than spend it on him/herself.

T

F

9. My child wishes he/she were older and doesn't accept his/her age.

T

F

10. My child usually helps find solutions to problems so that everyone comes out ahead.

T

F

11. My child likes to plan a lot even for ordinary things.

T

F

12. When my child attempts something new, he/she usually feels very nervous.

T

F

13. My child does just enough to get by even though he/she is capable of doing much better.

T

F

14. My child wishes that he/she were smarter than everyone else.

T

F

15. My child would even do nasty things if it meant being popular.

T

F

16. My child believes that miracles happen.

T

F

17. My child seems to be shy with new people.

T

F

18. My child is satisfied with his/her accomplishments and has little desire to do better.

T

F

19. My child sometimes feels he/she can predict the future.

T

F

20. My child thinks about things a lot before making a decision.

T

F

21. My child believes you don't have to be dishonest in order to be successful.

T

F

22. My child is very shy when meeting new peers.

T

F

23.My child wishes that he/she were stronger than everybody else.

T

F

24. My child believes in ESP.

T

F

25. My child usually doesn't share his/her feelings with others.

T

F

26. My child prefers to make choices only after reviewing the options.

T

F

27. My child is not afraid to try even the scariest ride at the amusement park.

T

F

28. Please circle True.

T

F

29. My child is sensitive to the feelings of others.

T

F

30.My child seems to have spiritual connections with others.

T

F

31.My child often waits for someone else to provide the solution to his/her problems.

T

F

32.My child will not complete a task if it takes too long.

T

F

33.My child usually follows the rules.

T

F

34.My child worries more than others that bad things might happen.

T

F

35. My child really likes to help others.

T

F

36. My child wishes to be more powerful than other kids.

T

F

37. My child prefers not having any rules at all.

T

F

38. I think my child recovers more slowly from illness and stress than other children.

T

F

39. It wouldn't bother my child to be alone all of the time.

T

F

40. My child is bothered for a long time when he/she treats other children badly, even if they have been mean to him/her.

T

F

41. My child wishes that he/she had special powers like Superman.

T

F

42. My child is very bossy.

T

F

43. My child feels relaxed about-meeting new people.

T

F

44.My child is considerate of others, even those who have been mean to him/her in the past.

T

F

45. My child believes that spiritual forces sometimes direct life.

T

F

46. My child doesn't know what to do when faced with a problem.

T

F

47. My child usually checks with someone else before starting an activity.

T

F

48. My child does not seem emotionally moved by sad songs or movies.

T

F

49. My child is more energetic and tires less quickly than most children his/her age.

T

F

50. My child likes to share with older children what he/she has learned.

T

F

51. My child pushes him/herself to the limit when pursuing a goal.

T

F

52. My child usually can solve most problems and puzzles.

T

F

53. My child likes to save money rather than to spend it.

T

F

54. My child seems to talk about personal things with his/her friends.

T

F

55. My child needs a lot of pampering and reassurance when he/she is sick.

T

F

56. My child understands that he/she can also learn from other kids.

T

F

57. My child is responsible compared to other children.

T

F

58. My child wants things to be done in a strict and orderly way.

T

F

59. It takes longer for my child to get over being embarrassed.

T

F

60. My child avoids even close people when upset.

T

F

61. My child is good at keeping promises.

T

F

62. Please circle FALSE.

T

F

63. My child insists that other kids do things his/her way.

T

F

64. My child daydreams all the time.

T

F

65. It is easier for my child to do new and fun things when close people are with him/her.

T

F

66. My child nearly always stays relaxed and carefree even when most other children are fearful or upset.

T

F

67. My child does not seem emotionally moved by sad songs or movies.

T

F

68. My child feels forced by circumstances or people to do things against his/her will.

T

F

69.My child is respectful of other kids who are different from him/her.

T

F

70. My child sometimes feels that sill living things are connected.

T

F

71. My child makes decisions quickly because he/she doesn't like to wait.

T

F

72. My child does not blame other people or circumstances for his/her choices.

T

F

73. My child worries in advance before trying new things.

T

F

74. My child doesn't seem to understand other kids' feelings.

T

F

75. My child will break rules if he/she can get away with it.

T

F

76. My child is a perfectionist.

T

F

77. My child doesn't seem to understand the importance of setting goals.

T

F

78. My child understands that everybody wins when people help each other.

T

F

79. My child hardly ever daydreams.

T

F

80. My child is often fearful of trying new things.

T

F

81. My child doesn't seem to understand why he/she should work to be better.

T

F

82. My child treats everyone with kindness and respect no matter how unimportant or bad they are.

T

F

83. My child really doesn't like to be alone when upset.

T

F

84. My child seems tense and nervous in unfamiliar situations.

T

F

85. My child has trouble telling a lie even if it's meant to spare someone else's feelings.

T

F

86. My child usually waits for other kids to take the lead when something has to be done.

T

F

87. My child thinks he/she has ESP.

T

F

88. My child bounces back easily from minor illnesses and stress.

T

F

89. My child doesn't like to be bothered by other children's problems.

T

F

90. My child seems emotionally moved by sad songs or movies.

T

F

91. It seems like my child could play all day and night without resting.

T

F

92. If a quick decision is needed, my child has more trouble than most children.

T

F

93. My child usually chooses not to help other children.

T

F

94. My child is very shy when meeting new adults.

T

F

95. My child understands that practice helps him/her to be successful.

T

F

96. I have lied a lot on this questionnaire.

T

F

97. It seems that fairness and honesty have little role in some aspects of my child's life.

T

F

98. My child is good at exaggerating or stretching the truth.

T

F

99. My child is not at all shy with strangers.

T

F

100. My child enjoys helping others even if they treat him/her badly.

T

F

101. My child generally sets goals and follows them (attain new skills, good grades, meet new people).

T

F

102. Then my child has to meet new people, he/she worries a lot ahead of time.

T

F

103. Even when my child is aware of potential danger, he/she will still take risks.

T

F

104. Because my child doesn't practice, he/she is not as successful as he/she could be.

T
F

105. My child does not like to confide in anyone.

T
F

106. My child seems to feel lucky.

T
F

107. My child reports having religious-like experiences.

T
F

108. My child wishes that he/she were the best looking kid in the world.

T
F

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.

THE FAMILY ENVIRONMENT SCALE

LISTED BELOW ARE A NUMBER OF STATEMENTS ABOUT FAMILIES.

PLEASE TICK EACH STATEMENT THAT IS TRUE ABOUT YOUR FAMILY.
(NOTE ONLY TRUE OR FALSE ANSWERS ARE ACCEPTABLE –
THERE'S NO IN-BETWEEN)

DON'T DELIBERATE TOO LONG ON ANY ONE STATEMENT
FIRST IMPRESSIONS ARE BEST.

FAMILY MEMBERS REALLY HELP AND SUPPORT ONE ANOTHER.

FAMILY MEMBERS OFTEN KEEP THEIR FEELINGS TO THEMSELVES.

WE FIGHT A LOT IN OUR FAMILY.

WE DON'T DO THINGS ON OUR OWN VERY OFTEN IN OUR FAMILY.

WE FEEL IT IS IMPORTANT TO BE THE BEST AT WHATEVER YOU DO.

WE OFTEN TALK ABOUT POLITICAL AND SOCIAL PROBLEMS.

WE SPEND MOST WEEKENDS AND EVENINGS AT HOME.

FAMILY MEMBERS ATTEND RELIGIOUS SERVICES FAIRLY OFTEN.

ACTIVITIES IN OUR FAMILY ARE PRETTY CAREFULLY PLANNED.

FAMILY MEMBERS ARE RARELY ORDERED AROUND.

WE OFTEN SEEM TO BE KILLING TIME AT HOME.

WE SAY ANYTHING WE WANT TO AROUND HOME.

FAMILY MEMBERS RARELY BECOME OPENLY ANGRY.

IN OUR FAMILY, WE ARE STRONGLY ENCOURAGED TO BE INDEPENDENT.

GETTING AHEAD IN LIFE IS VERY IMPORTANT IN OUR FAMILY.

WE RARELY GO TO LECTURES, PLAYS, OR CONCERTS.

FRIENDS OFTEN COME OVER FOR DINNER OR TO VISIT.

WE DON'T SAY PRAYERS IN OUR FAMILY.

WE ARE GENERALLY VERY NEAT AND ORDERLY.

THERE ARE VERY FEW RULES TO FOLLOW IN OUR FAMILY.

WE PUT A LOT OF ENERGY INTO WHAT WE DO AT HOME.

IT'S HARD TO 'BLOW OFF STEAM' AT HOME WITHOUT UPSETTING SOMEBODY.

FAMILY MEMBERS SOMETIMES GET SO ANGRY THEY THROW THINGS.

WE THINK THINGS OUT FOR OURSELVES IN OUR FAMILY.

HOW MUCH MONEY A PERSON MAKES IS NOT VERY IMPORTANT TO US.

LEARNING ABOUT NEW AND DIFFERENT THINGS IS VERY IMPORTANT IN OUR FAMILY.

NOBODY IN OUR FAMILY IS ACTIVE IN SPORTS.

WE OFTEN TALK ABOUT THE RELIGIOUS MEANING OF CHRISTMAS, PASSOVER, OR OTHER HOLIDAYS.

IT'S OFTEN HARD TO FIND THINGS WHEN YOU NEED THEM IN OUR HOUSEHOLD.

THERE IS ONE FAMILY MEMBER WHO MAKES MOST OF THE DECISIONS.

THERE IS A FEELING OF TOGETHERNESS IN OUR FAMILY.

WE TELL EACH OTHER ABOUT OUR PERSONAL PROBLEMS.

FAMILY MEMBERS HARDLY EVER LOSE THEIR TEMPERS.

WE COME AND GO AS WE WANT TO IN OUR FAMILY.

WE BELIEVE IN COMPETITION AND 'MAY THE BETTER PERSON WIN'.

WE ARE NOT THAT INTERESTED IN CULTURAL ACTIVITIES.

WE OFTEN GO TO MOVIES, SPORTS EVENTS, TRAMPING, ETC.

WE DON'T BELIEVE IN HEAVEN OR HELL.

BEING ON TIME IS VERY IMPORTANT IN OUR FAMILY.

THERE ARE SET WAYS OF DOING THINGS AT HOME.

WE RARELY VOLUNTEER WHEN SOMETHING HAS TO BE DONE AT HOME.

IF WE FEEL LIKE DOING SOMETHING ON THE SPUR OF THE MOMENT, WE OFTEN JUST PICK UP AND GO.

FAMILY MEMBERS OFTEN CRITICIZE EACH OTHER.

THERE IS VERY LITTLE PRIVACY IN OUR FAMILY.

WE ALWAYS STRIVE TO DO THINGS JUST A LITTLE BETTER THE NEXT TIME.

WE RARELY HAVE INTELLECTUAL DISCUSSIONS.

EVERYONE IN OUR FAMILY HAS A HOBBY OR TWO.

FAMILY MEMBERS HAVE STRICT IDEAS ABOUT WHAT IS RIGHT AND WRONG.

PEOPLE CHANGE THEIR MINDS OFTEN IN OUR FAMILY.

THERE IS A STRONG EMPHASIS ON FOLLOWING RULES IN OUR FAMILY.

FAMILY MEMBERS REALLY BACK EACH OTHER UP.

SOMEONE USUALLY GETS UPSET IF YOU COMPLAIN IN OUR FAMILY.

FAMILY MEMBERS SOMETIMES HIT EACH OTHER.

FAMILY MEMBERS ALMOST ALWAYS RELY ON THEMSELVES WHEN A PROBLEM COMES UP.

FAMILY MEMBERS RARELY WORRY ABOUT JOB PROMOTIONS, SCHOOL GRADES, ETC.

SOMEONE IN OUR FAMILY PLAYS A MUSICAL INSTRUMENT.

FAMILY MEMBERS ARE NOT VERY INVOLVED IN RECREATIONAL ACTIVITIES OUTSIDE WORK OR SCHOOL.

WE BELIEVE THERE ARE JUST SOME THINGS YOU HAVE TO TAKE ON FAITH.

FAMILY MEMBERS MAKE SURE THEIR ROOMS ARE NEAT.

EVERYONE HAS AN EQUAL SAY IN FAMILY DECISIONS.

THERE IS VERY LITTLE GROUP SPIRIT IN OUR FAMILY.

MONEY AND PAYING BILLS IS OPENLY TALKED ABOUT IN OUR FAMILY.

IF THERE'S A DISAGREEMENT IN OUR FAMILY, WE TRY HARD TO SMOOTH THINGS OVER AND KEEP THE PEACE.

FAMILY MEMBERS STRONGLY ENCOURAGE EACH OTHER TO STAND UP FOR THEIR RIGHTS.

IN OUR FAMILY, WE DON'T TRY THAT HARD TO SUCCEED.

FAMILY MEMBERS OFTEN GO TO THE LIBRARY.

FAMILY MEMBERS SOMETIMES ATTEND COURSES OR TAKE LESSONS FOR SOME HOBBY OR INTEREST (OUTSIDE OF SCHOOL).

IN OUR FAMILY, EACH PERSON HAS DIFFERENT IDEAS ABOUT WHAT IS RIGHT AND WRONG.

EACH PERSON'S DUTIES ARE CLEARLY DEFINED IN OUR FAMILY.

WE CAN DO WHATEVER WE WANT TO IN OUR FAMILY.

WE REALLY GET ALONG WELL WITH EACH OTHER.

WE ARE USUALLY CAREFUL ABOUT WHAT WE SAY TO EACH OTHER .

FAMILY MEMBERS OFTEN TRY TO ONE-UP OR OUT-DO EACH OTHER.

IT'S HARD TO BE BY YOURSELF WITHOUT HURTING SOMEONE'S FEELINGS IN OUR HOUSEHOLD.

'WORK BEFORE PLAY' IS THE RULE IN OUR FAMILY.

WATCHING TV IS MORE IMPORTANT THAN READING IN OUR FAMILY.

FAMILY MEMBERS GO OUT A LOT.

THE BIBLE, TORAH, OR KORAN IS A VERY IMPORTANT BOOK IN OUR HOME.

MONEY IS NOT HANDLED VERY CAREFULLY IN OUR FAMILY.

RULES ARE PRETTY INFLEXIBLE IN OUR HOUSEHOLD.

THERE IS PLENTY OF TIME AND ATTENTION FOR EVERYONE IN OUR FAMILY.

THERE ARE A LOT OF SPONTANEOUS DISCUSSIONS IN OUR FAMILY.

IN OUR FAMILY, WE BELIEVE YOU DON'T GET ANYWHERE BY RAISING YOUR VOICE.

WE ARE NOT REALLY ENCOURAGED TO SPEAK UP FOR OURSELVES IN OUR FAMILY.

FAMILY MEMBERS ARE OFTEN COMPARED WITH OTHERS AS TO HOW WELL THEY ARE DOING AT WORK OR SCHOOL.

FAMILY MEMBERS REALLY LIKE MUSIC, ART, AND LITERATURE.

OUR MAIN FORM OF ENTERTAINMENT IS WATCHING TV OR LISTENING TO THE RADIO.

FAMILY MEMBERS BELIEVE THAT IF YOU SIN YOU WILL BE PUNISHED.

DISHES ARE USUALLY DONE IMMEDIATELY AFTER EATING.

YOU CAN'T GET AWAY WITH MUCH IN OUR FAMILY.

Attributional Style Questionnaire – Revised – Parent Version

re are some situations. I want you to try to imagine that they have just happened to your child. I want you to choose between the choices provide, the most likely reason to explain why the situation happened to your child. There are no right or wrong swers so always pick the reason that seems to explain why the situation happened to your child, even if it has never actually curred. Circle either "A" or "B" for each question.

1. Your child gets an A on a test . My child is smart. . My child is good in the subject that the test was in.	**2. Some kids that your child knows say that they do not like your child.** A. Once in a while people are mean to my child. B. Once in a while my child is mean to other people.
. A good friend tells your child that he/she hates your ild. . My child's friend was in a bad mood that day. . My child wasn't nice to his/her friend that day.	**4. A person steals money from your child.** A. That person is dishonest. B. People are not honest.
You praise something that your child makes. . My child is good at making some things. . I like some things my child makes.	**6. Your child breaks a glass.** A. My child is not careful enough. B. Sometimes my child is not careful enough.
Your child gets a bad grade in school. . My child is not a good student. . Teachers give unfair tests.	**8. Your child makes a new friend.** A. My child is a nice person. B. The people that my child meets are nice.
Your child has been getting along well with your mily. . My child is easy to get along with when with my family. . Once in a while my child is easy to get along with when ith my family.	**10. Your child does a project with a group of kids and it turns out badly.** A. My child doesn't work well with the people in the group. B. My child never works well with a group.
1. Your child walks into a door and gets a bloody nose. . My child wasn't looking where he/she was going. . My child has been careless lately.	**12. Your child has a messy room.** A. My child did not clean his/her room that day. B. My child usually does not clean his/her room.
3. You make your child's favorite dinner. . There are a few things that I will do to please my child. . I like to please my child.	**14. A team that your child is on loses a game.** A. The team members don't play well together. B. That day the team members didn't play well together.
5. Your child does not get the chores done at home. . My child was lazy that day. . Many days my child is lazy.	**16. Your child goes to an amusement park and has a good time.** A. My child usually enjoys him/her self at amusement parks. B. My child usually enjoys him/her self.
7. Your child goes to a friend's party and has fun. . My child's friend gives good parties. . My child's friend gave a good party that day.	**18. Your child has a substitute teacher and he/she likes your child.** A. My child was well behaved during class that day. B. My child is almost always well behaved during class.
9. Your child makes his/her friends happy. . My child is a fun person to be with. . Sometimes my child is a fun person to be with.	**20. Your child puts a hard puzzle together.** A. My child is good at putting puzzles together. B. My child is good at doing many things.
1. Your child tries out for a sports team and does not ake it. . My child is not good at sports. . The other kids who tried out are very good at sports.	**22. Your child fails a test.** A. All tests are hard. B. Only some tests are hard.
3. Your child hits a home run in a ball game. . My child swung the bat just right. . The pitcher threw an easy pitch.	**24. Your child does the best in his/her class on a paper.** A. The other kids in my child's class did not work hard on their papers. B. My child worked hard on the paper.

The New Zealand Socioeconomic Index of Occupational Status (NZSEI)

Research Report #2

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Miriam Ransom

Patrick Ongley

The opinions presented in this report are those of the authors and do not necessarily represent an official view of Statistics New Zealand

Statistics NEW ZEALAND Te Tari Tatau

NZSCO	Description	NZSEI
2411	Accountants	71
4121	Accounting and Bookkeeping Clerks	42
3321	Administrative and Related Associate Professionals	60
1225	Advertising and Public Relations Managers	54
2213	Agricultural Scientists	79
3212	Agricultural Technicians	58
3144	Air Traffic Controllers	73
3143	Aircraft Pilots and Related Workers	73
6144	Animal Welfare Workers	40
6124	Apiarists	25
3317	Appraisers and Valuers	57
6142	Aquatic Life Cultivation Workers	40
2141	Architects, Town and Traffic Planners	73
2431	Archivists and Curators	62
0111	Armed Forces	54
3369	Athletes and Related Workers	50
3318	Auctioneers	57
3361	Authors, Journalists and Other Writers	50
8274	Baked Goods Producing and Cereals Processing Machine Operators	38
7412	Bakers	38
2421	Barristers and Solicitors	89
4215	Bill, Debt and Related Cash Collectors	43
7332	Binding Trades Workers	49
2211	Biologists, Botanists, Zoologists and Related Professionals	79
7221	Blacksmiths	54
3323	Bookkeepers	60
8279	Brewers, Wine and Other Beverage Machine Operators	38
7111	Bricklayers and Stonemasons	45
3132	Broadcasting and Telecommunications Equipment Controllers	54
8411	Building and Related Workers	44
8322	Bus Drivers	39
7411	Butchers	38
3316	Buyers	57
7421	Cabinet Makers and Related Workers	40
4113	Calculating Machine Operators	45
8321	Car, Taxi and Light Van Drivers	39
3351	Careers and Employment Advisors	55
9111	Caretakers and Cleaners	27
7112	Carpenters and Joiners	45
2148	Cartographers and Surveyors	73
4211	Cashiers and Ticket Issuers	43
8212	Cement and Other Minerals Processing Machine Operators	38
3116	Chemical Engineering Technicians	63
2146	Chemical Engineers	73
2113	Chemists	82
5142	Child Care Workers	34
3365	Choreographers and Dancers	50
3112	Civil Engineering Technicians	63
2142	Civil Engineers	73
3368	Clowns, Magicians, Acrobats and Related Workers	50
4143	Coding, Proofreading and Related Clerks	41
3364	Composers, Musicians and Singers	50
3121	Computer Equipment Controllers	55
2131	Computing Professionals	75
1227	Computing Services Managers	54

5122	Cooks	27
1211	Corporate Managers or Managing Directors	65
2445	Counsellors	75
8333	Crane Operators	40
6125	Crop and Livestock Producers	25
4213	Croupiers	43
8151	Crushing, Grinding and Mixing Equipment Operators	51
3331	Customs and Border Inspectors	65
8272	Dairy Products Machine Operators	38
4112	Data Entry Operators	45
3363	Decorators and Commercial Designers	50
3222	Dental Assistants	55
2222	Dentists	90
2225	Dietitians and Public Health Nutritionists	90
3118	Draughting Technicians	63
2332	Early Childhood Teaching Professionals	61
8332	Earthmoving and Related Machinery Operators	40
2441	Economists	75
2351	Education Advisors	77
2352	Education Reviewers	77
3113	Electrical Engineering Technicians	63
2143	Electrical Engineers	73
8292	Electrical Machinery Assemblers	40
7241	Electrical Mechanics and Fitters	53
7131	Electricians	49
2144	Electronic and Telecommunications Engineers	73
3114	Electronic Engineering Technicians	63
7242	Electronics Fitters and Servicers	53
3381	Environmental Protection Associate Professionals	59
5231	Fashion and Other Models	23
6111	Field Crop and Vegetable Growers	22
3366	Film, Stage and Related Actors and Directors	50
8152	Filtering and Separating Equipment Operators	51
1222	Finance and Administration Managers	54
5151	Fire Fighters	61
6141	Fishery Workers	40
7223	Fitters and Turners	54
7433	Floor Covering Layers	36
6131	Forestry Workers and Loggers	39
6112	Fruit Growers	22
8275	Fruit, Vegetable and Nut Processing Machine Operators	38
6113	Gardeners and Nursery Growers	22
2114	Geologists and Geophysicists	82
8131	Glass and Ceramics Kiln Operators	30
7321	Glass Cutters and Finishers	50
7122	Glaziers	49
8273	Grain and Spice Milling Machine Operators	38
5141	Hairdressers, Barbers, Beauticians and Related Workers	34
8323	Heavy Truck Drivers	39
5121	Housekeepers	27
6143	Hunters and Trappers	40
3312	Insurance Representatives	57
7313	Jewellery and Precious Metal Trades Workers	44
2422	Judges	89
9151	Labourers	30
8281	Leather and Related Products Processors	36

8295	Leather Goods Assemblers	40
7441	Leather Goods Makers	30
3322	Legal and Related Business Associate Professionals	60
1111	Legislators	84
2432	Librarians and Related Information Professionals	62
4141	Library and Filing Clerks	41
3211	Life Science Technicians	58
8334	Lifting-Truck Operators	40
6121	Livestock Producers	25
8211	Machine Tool Operators	38
7231	Machinery Mechanics and Fitters	49
4142	Mail Carriers and Sorting Clerks	41
2121	Mathematicians, Statisticians and Related Professionals	83
8271	Meat and Fish Processing Machine Operators	38
3115	Mechanical Engineering Technicians	63
2145	Mechanical Engineers	73
8291	Mechanical Machinery Assemblers	40
2221	Medical Doctors	90
3133	Medical Equipment Controllers	54
9121	Messengers and Doorkeepers	42
8124	Metal Drawers and Extruders	43
8222	Metal Finishers, Platers and Coaters	34
8122	Metal Melters, Casters and Rolling Mill Operators	43
7211	Metal Moulders	45
8123	Metal Welders	43
8293	Metal, Rubber and Plastic Products Assemblers	40
2112	Meteorologists	82
2212	Microbiologists and Related Professionals	79
8112	Mineral Ore and Stone Treating Plant Operators	47
3117	Mining and Metallurgical Technicians	63
2147	Mining Engineers, Metallurgists and Related Professionals	73
8111	Mining Plant Operators	47
6122	Mixed Livestock Producers	25
8331	Motorised Farm Machinery Operators	40
7312	Musical Instrument Makers and Tuners	44
3371	Non-Ordained Religious Associate Professionals	10
2231	Nursing and Midwifery Professionals	60
3231	Nursing Associate Professionals	51
4144	Office Clerks	41
3221	Opticians	55
8121	Ore Smelting, Metal Converting and Refining Furnace Operators	43
6126	Other Agriculture Workers	25
2413	Other Business Professionals	71
8154	Other Chemical Processing Plant Operators	51
3119	Other Engineering Technicians	63
3319	Other Finance and Sales Associate Professionals	57
8132	Other Glass and Ceramics Workers	30
3332	Other Government Associate Professionals	65
3226	Other Health Associate Professionals	55
2226	Other Health Professionals (except Nursing)	90
2423	Other Legal Professionals	89
5154	Other Protective Service Workers	61
8232	Other Rubber and Plastics Products Machine Operators	36
1229	Other Specialised Managers	54
8265	Other Textile Products Machine Operators	23
9141	Packers and Freight Handlers	34

7124	Painters and Paperhangers	49
8251	Paper and Paperboard Products Machine Operators	39
8142	Paper Pulp Preparation Plant Operators	49
8143	Papermaking Plant Operators	49
4214	Pawnbrokers and Moneylenders	43
5131	Personal Care Workers	29
1223	Personnel and Industrial Relations Managers	54
2412	Personnel Professionals	71
8221	Pharmaceutical and Toiletry Products Machine Operators	34
3225	Pharmaceutical Assistants	55
2224	Pharmacists	90
2443	Philologists, Translators and Interpreters	75
3131	Photographers and Image and Sound Recording Equipment Controllers	54
8223	Photographic Products Machine Operators	34
3111	Physical Science Technicians	63
2111	Physicists and Astronomers	82
3223	Physiotherapists	55
7121	Plasterers	49
7123	Plumbers	49
5152	Police	61
6123	Poultry Producers	25
8161	Power Generating Plant Operators	60
7311	Precision Instrument Makers and Repairers	44
2331	Primary Teaching Professionals	61
7333	Printing Engravers and Etchers	49
7331	Printing Trades Workers	49
5153	Prison Guards	61
1221	Production and Operations Managers	54
4132	Production Clerks	44
2444	Psychologists	75
7243	Radio and Television Servicers	53
3367	Radio, Television and Other Announcers	50
8311	Railway Engine Drivers	61
3313	Real Estate Agents	57
4221	Receptionists and Information Clerks	38
9131	Refuse Collectors and Related Labourers	36
2451	Religious Professionals	39
1228	Research and Development Managers	54
3151	Safety and Health Inspectors	62
1224	Sales and Marketing Managers	54
5211	Salespersons and Demonstrators	33
7224	Saw Doctors	54
8141	Sawmill, Wood Panel and Related Wood-Processing Plant Operators	49
3362	Sculptors, Painters and Related Artists	50
2321	Secondary Teaching Professionals	77
4114	Secretaries	45
3311	Securities and Finance Dealers and Brokers	57
1131	Senior Business Administrators	90
1121	Senior Government Administrators	82
8263	Sewing and Embroidering Machine Operators	23
7212	Sheet-Metal Workers	45
8341	Ships' Deck Crews and Workers	49
3142	Ships' Deck Officers and Pilots	73
3141	Ships' Engineers	73
2442	Social Scientists	75
3341	Social Work Associate Professionals	50

2341	Special Education Teaching Professionals	57
1141	Special-Interest Organisation Administrators	63
8261	Spinning and Winding Machine Operators	23
4122	Statistical and Finance Clerks	42
3324	Statistical and Mathematical Associate Professionals	60
8153	Still and Reactor Operators	51
4131	Stock Clerks	44
5221	Street Vendors	46
8276	Sugar Processing and Refining Machine Operators	38
1226	Supply and Distribution Managers	54
7431	Tailors and Dressmakers	36
8277	Tea, Coffee, Cocoa Machine Operators	38
3315	Technical and Commercial Sales Representatives	57
4222	Telephone Switchboard Operators	38
4212	Tellers and Other Counter Clerks	43
2311	Tertiary Teaching Professionals	78
8264	Textile Bleaching, Dyeing and Cleaning Machine Operators	23
8278	Tobacco Products Processing Machine Operators	38
7222	Toolmakers, Pattern Makers and Metal Markers	54
4133	Transport Clerks	44
5111	Travel Attendants	52
3314	Travel Consultants and Organisers	57
5112	Travel Guides	52
4111	Typists and Word Processor Operators	45
8231	Tyre Making and Vulcanising Machine Operators	36
5143	Undertakers and Embalmers	34
8412	Underwater Workers	44
7432	Upholsterers and Related Workers	36
2223	Veterinarians	90
3224	Veterinary Assistants	55
5123	Waiters and Bartenders	27
8262	Weaving and Knitting Machine Operators	23
8113	Well Drillers and Borers and Related Workers	47
8294	Wood and Related Materials Products Assemblers	40
8241	Wood Products Machine Operators	38
8242	Wood Treaters	38
999	Workers not Classifiable by Occupation	
9999	Workers not Classifiable by Occupation	

APPENDIX 3

1. Conners' Teacher Rating Scale – Revised

2. Teacher Report Form

Conners' Teacher Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

Student's Name:_____ **Gender:** M F
(Circle One)

Birthdate: ____/____/____ (Month/Day/Year) **Age:**_____ **School Grade:**_____

Teacher's Name:_____ **Today's Date:** ____/____/____ (Month/Day/Year)

Instructions: Below are a number of common problems that children have in school. Please rate each item according to how much of a problem it has been in the last month. For each item, ask yourself "How much of a problem has this been in the last month?", and circle the best answer for each one. If none, not at all, seldom, or very infrequently, you would circle 0. If very much true, or it occurs very often or frequently, you would circle 3. You would circle 1 or 2 for ratings in between. Please respond to all the items.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
1. Defiant	0	1	2	3
2. Restless in the "squirmy" sense	0	1	2	3
3. Forgets things he/she has already learned	0	1	2	3
4. Appears to be unaccepted by group	0	1	2	3
5. Feelings easily hurt	0	1	2	3
6. Is a perfectionist	0	1	2	3
7. Temper outbursts; explosive, unpredictable behavior	0	1	2	3
8. Excitable, impulsive	0	1	2	3
9. Fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities	0	1	2	3
10. Sassy	0	1	2	3
11. Is always "on the go" or acts as if driven by a motor	0	1	2	3
12. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)	0	1	2	3
13. Is one of the last to be picked for teams or games	0	1	2	3
14. Is an emotional child	0	1	2	3
15. Everything must be just so	0	1	2	3
16. Restless or overactive	0	1	2	3
17. Fails to finish things he/she starts	0	1	2	3
18. Does not seem to listen to what is being said to him/her	0	1	2	3
19. Actively defies or refuses to comply with adults' requests	0	1	2	3
20. Leaves seat in classroom or in other situations in which remaining seated is expected	0	1	2	3
21. Poor in spelling	0	1	2	3
22. Has no friends	0	1	2	3
23. Timid, easily frightened	0	1	2	3
24. Keeps checking things over and over	0	1	2	3
25. Cries often and easily	0	1	2	3
26. Inattentive, easily distracted	0	1	2	3
27. Has difficulty organizing tasks or activities	0	1	2	3
28. Has difficulty sustaining attention in tasks or play activities	0	1	2	3
29. Has difficulty waiting his/her turn	0	1	2	3
30. Not reading up to par	0	1	2	3

Items continued on back page...

Conners' Teacher Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
31. Does not know how to make friends	0	1	2	3
32. Sensitive to criticism	0	1	2	3
33. Seems over-focused on details	0	1	2	3
34. Fidgeting	0	1	2	3
35. Disturbs other children	0	1	2	3
36. Talks excessively	0	1	2	3
37. Argues with adults	0	1	2	3
38. Cannot remain still	0	1	2	3
39. Runs about or climbs excessively in situations where it is inappropriate	0	1	2	3
40. Lacks interest in schoolwork	0	1	2	3
41. Has poor social skills	0	1	2	3
42. Has difficulty playing or engaging in leisure activities quietly	0	1	2	3
43. Likes everything neat and clean	0	1	2	3
44. Fidgets with hands or feet or squirms in seat	0	1	2	3
45. Demands must be met immediately—easily frustrated	0	1	2	3
46. Blurts out answers to questions before the questions have been completed	0	1	2	3
47. Spiteful or vindictive	0	1	2	3
48. Short attention span	0	1	2	3
49. Loses things necessary for tasks or activities (e.g., school assignments, pencils, books, tools, or toys)	0	1	2	3
50. Only pays attention to things he/she is really interested in	0	1	2	3
51. Shy, withdrawn	0	1	2	3
52. Distractibility or attention span a problem	0	1	2	3
53. Things must be done the same way every time	0	1	2	3
54. Mood changes quickly and drastically	0	1	2	3
55. Interrupts or intrudes on others (e.g., butts into others' conversations or games)	0	1	2	3
56. Poor in arithmetic	0	1	2	3
57. Does not follow through on instructions and fails to finish schoolwork (not due to oppositional behavior or failure to understand instructions)	0	1	2	3
58. Easily distracted by extraneous stimuli	0	1	2	3
59. Restless, always up and on the go	0	1	2	3

TEACHER'S REPORT FORM FOR AGES 5–18

Please Print

For office use only
ID #

Your answers will be used to compare the pupil with other pupils whose teachers have completed similar forms. The information from this form will also be used for comparison with other information about this pupil. Please answer as well as you can, even if you lack full information. Scores on individual items will be combined to identify general patterns of behavior. Feel free to print additional comments beside each item and in the spaces provided on page 2.

PUPIL'S FULL NAME: FIRST MIDDLE LAST

PUPIL'S SEX: ☐ Boy ☐ Girl

PUPIL'S AGE

ETHNIC GROUP OR RACE

TODAY'S DATE: Mo. _____ Date _____ Yr. _____

PUPIL'S BIRTHDATE (if known): Mo. _____ Date _____ Yr. _____

GRADE IN SCHOOL

NAME AND ADDRESS OF SCHOOL

PARENTS' USUAL TYPE OF WORK, even if not working now *(Please be as specific as you can—for example, auto mechanic, high school teacher, homemaker, laborer, lathe operator, shoe salesman, army sergeant.)*

FATHER'S TYPE OF WORK: _____

MOTHER'S TYPE OF WORK: _____

THIS FORM FILLED OUT BY:

☐ Teacher (full name) _____

☐ Counselor (full name) _____

☐ Other (specify position & give full name): _____

I. **For how many months have you known this pupil?** _____ **months**

II. **How well do you know him/her?** 1. ☐ **Not Well** 2. ☐ **Moderately Well** 3. ☐ **Very Well**

III. **How much time does he/she spend in your class or service per week?**

IV. **What kind of class or service is it? (Please be specific, e.g., regular 5th grade, 7th grade math, learning disabled, counseling, etc.)**

V. **Has he/she ever been referred for special class placement, services, or tutoring?**
☐ Don't Know 0. ☐ No 1. ☐ Yes—what kind and when?

VI. **Has he/she repeated any grades?**
☐ Don't Know 0. ☐ No 1. ☐ Yes—grades and reasons

VII. **Current school performance**—list academic subjects and check box that indicates pupil's performance for each subject:

Academic subject	1. Far below grade	2. Somewhat below grade	3. At grade level	4. Somewhat above grade	5. Far above grade
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐
4.	☐	☐	☐	☐	☐
5.	☐	☐	☐	☐	☐
6.	☐	☐	☐	☐	☐

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VIII. **Compared to typical pupils of the same age:**	1. Much less	2. Somewhat less	3. Slightly less	4. About average	5. Slightly more	6. Somewhat more	7. Much more
1. How hard is he/she working?	☐	☐	☐	☐	☐	☐	☐
2. How appropriately is he/she behaving?	☐	☐	☐	☐	☐	☐	☐
3. How much is he/she learning?	☐	☐	☐	☐	☐	☐	☐
4. How happy is he/she?	☐	☐	☐	☐	☐	☐	☐

IX. **Most recent achievement test scores** (optional).

Name of test	Subject	Date	Percentile or grade level obtained

X. **IQ, readiness, or aptitude tests** (optional).

Name of test	Date	IQ or equivalent scores

Does this pupil have any illness or disability (either physical or mental)? ☐ No ☐ Yes—please describe:

What concerns you most about this pupil?

Please describe the best things about this pupil:

Please feel free to write any comments about this pupil's work, behavior, or potential, using extra pages if necessary.

Please Print

low is a list of items that describe pupils. For each item that describes the pupil ***now or within the past 2 months,*** please circle the *2* if the m is ***very true or often true*** of the pupil. Circle the *1* if the item is ***somewhat or sometimes true*** of the pupil. If the item is ***not true*** of the pupil, circle the *0*. Please answer all items as well as you can, even if some do not seem to apply to this pupil.

0 = Not True (as far as you know) 1 = Somewhat or Sometimes True 2 = Very True or Often True

0 1 2 1. Acts too young for his/her age
0 1 2 2. Hums or makes other odd noises in class
0 1 2 3. Argues a lot
0 1 2 4. Fails to finish things he/she starts
0 1 2 5. Behaves like opposite sex
0 1 2 6. Defiant, talks back to staff
0 1 2 7. Bragging, boasting
0 1 2 8. Can't concentrate, can't pay attention for long
0 1 2 9. Can't get his/her mind off certain thoughts; obsessions (describe): _____
0 1 2 10. Can't sit still, restless, or hyperactive
0 1 2 11. Clings to adults or too dependent
0 1 2 12. Complains of loneliness
0 1 2 13. Confused or seems to be in a fog
0 1 2 14. Cries a lot
0 1 2 15. Fidgets
0 1 2 16. Cruelty, bullying, or meanness to others
0 1 2 17. Daydreams or gets lost in his/her thoughts
0 1 2 18. Deliberately harms self or attempts suicide
0 1 2 19. Demands a lot of attention
0 1 2 20. Destroys his/her own things
0 1 2 21. Destroys property belonging to others
0 1 2 22. Difficulty following directions
0 1 2 23. Disobedient at school
0 1 2 24. Disturbs other pupils
0 1 2 25. Doesn't get along with other pupils
0 1 2 26. Doesn't seem to feel guilty after misbehaving
0 1 2 27. Easily jealous
0 1 2 28. Eats or drinks things that are not food—***don't*** include sweets (describe): _____
0 1 2 29. Fears certain animals, situations, or places other than school (describe): _____
0 1 2 30. Fears going to school
0 1 2 31. Fears he/she might think or do something bad
0 1 2 32. Feels he/she has to be perfect
0 1 2 33. Feels or complains that no one loves him/her
0 1 2 34. Feels others are out to get him/her
0 1 2 35. Feels worthless or inferior
0 1 2 36. Gets hurt a lot, accident-prone
0 1 2 37. Gets in many fights
0 1 2 38. Gets teased a lot
0 1 2 39. Hangs around with others who get in trouble
0 1 2 40. Hears sounds or voices that aren't there (describe): _____
0 1 2 41. Impulsive or acts without thinking
0 1 2 42. Would rather be alone than with others
0 1 2 43. Lying or cheating
0 1 2 44. Bites fingernails
0 1 2 45. Nervous, high-strung, or tense
0 1 2 46. Nervous movements or twitching (describe): _____
0 1 2 47. Overconforms to rules
0 1 2 48. Not liked by other pupils
0 1 2 49. Has difficulty learning
0 1 2 50. Too fearful or anxious
0 1 2 51. Feels dizzy
0 1 2 52. Feels too guilty
0 1 2 53. Talks out of turn
0 1 2 54. Overtired
0 1 2 55. Overweight
56. Physical problems ***without known medical cause:***
0 1 2 a. Aches or pains (***not*** stomach or headaches)
0 1 2 b. Headaches
0 1 2 c. Nausea, feel sick
0 1 2 d. Problems with eyes (***not*** if corrected by glasses) (describe): _____
0 1 2 e. Rashes or other skin problems
0 1 2 f. Stomachaches or cramps
0 1 2 g. Vomiting, throwing up
0 1 2 h. Other (describe): _____

Please see other side

Please Print

0 = Not True (as far as you know) 1 = Somewhat or Sometimes True 2 = Very True or Often True

0 1 2 57. Physically attacks people
0 1 2 58. Picks nose, skin, or other parts of body (describe): _____
0 1 2 59. Sleeps in class
0 1 2 60. Apathetic or unmotivated
0 1 2 61. Poor school work
0 1 2 62. Poorly coordinated or clumsy
0 1 2 63. Prefers being with older children or youths
0 1 2 64. Prefers being with younger children
0 1 2 65. Refuses to talk
0 1 2 66. Repeats certain acts over and over, compulsions (describe): _____
0 1 2 67. Disrupts class discipline
0 1 2 68. Screams a lot
0 1 2 69. Secretive, keeps things to self
0 1 2 70. Sees things that aren't there (describe): _____
0 1 2 71. Self-conscious or easily embarrassed
0 1 2 72. Messy work
0 1 2 73. Behaves irresponsibly (describe): _____
0 1 2 74. Showing off or clowning
0 1 2 75. Shy or timid
0 1 2 76. Explosive and unpredictable behavior
0 1 2 77. Demands must be met immediately, easily frustrated
0 1 2 78. Inattentive, easily distracted
0 1 2 79. Speech problem (describe): _____
0 1 2 80. Stares blankly
0 1 2 81. Feels hurt when criticized
0 1 2 82. Steals
0 1 2 83. Stores up things he/she doesn't need (describe): _____
0 1 2 84. Strange behavior (describe): _____
0 1 2 85. Strange ideas (describe): _____
0 1 2 86. Stubborn, sullen, or irritable
0 1 2 87. Sudden changes in mood or feelings
0 1 2 88. Sulks a lot
0 1 2 89. Suspicious
0 1 2 90. Swearing or obscene language
0 1 2 91. Talks about killing self
0 1 2 92. Underachieving, not working up to potential
0 1 2 93. Talks too much
0 1 2 94. Teases a lot
0 1 2 95. Temper tantrums or hot temper
0 1 2 96. Seems preoccupied with sex
0 1 2 97. Threatens people
0 1 2 98. Tardy to school or class
0 1 2 99. Too concerned with neatness or cleanliness
0 1 2 100. Fails to carry out assigned tasks
0 1 2 101. Truancy or unexplained absence
0 1 2 102. Underactive, slow moving, or lacks energy
0 1 2 103. Unhappy, sad, or depressed
0 1 2 104. Unusually loud
0 1 2 105. Uses alcohol or drugs for nonmedical purposes (describe): _____
0 1 2 106. Overly anxious to please
0 1 2 107. Dislikes school
0 1 2 108. Is afraid of making mistakes
0 1 2 109. Whining
0 1 2 110. Unclean personal appearance
0 1 2 111. Withdrawn, doesn't get involved with others
0 1 2 112. Worries

113. Please write in any problems the pupil has that were not listed above:

0 1 2 _____
0 1 2 _____
0 1 2 _____

PLEASE BE SURE YOU HAVE ANSWERED ALL ITEMS

APPENDIX 4

1. Parent's Information Sheet
2. Teacher's Information Sheet
3. Parental Consent Form
4. Parent's Teacher Consent Form
5. Child Assessment Form

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Attention Deficit Hyperactivity Disorder and Creativity: What is the link?

Parent's Information Sheet

You are invited to take part in the current study on the similarities and differences between children diagnosed with ADHD (Attention Deficit Hyperactivity Disorder) and those identified as being highly creative. The purpose of this study is to understand what distinguishes between these two phenomena in order to clarify the concepts and avoid the misdiagnosis of these children. There are some striking similarities between the types of behaviors displayed by some ADHD and creative children such that it is often extremely difficult to distinguish between the two. The misdiagnosis of these children would have huge implications for their further development. Children with ADHD often need to be medicated and thrive best in a structured learning environment. On the other hand, highly creative children do best in vastly stimulating, ever changing environments and have no need for medication.

In this study we will be working with three groups of children, those diagnosed with ADHD, those identified as being highly creative, and a comparison group who have neither been diagnosed with ADHD nor identified as highly creative. All of the parents, teachers and children that take part in the study will be required to follow the same procedure so that we can accurately compare the three groups to find out exactly where these children differ. This will help us to clearly distinguish between the two phenomena and avoid future misdiagnosis.

Taking part in this study will begin with a package that will be sent to your home. This pack will include some questionnaires for both the parents and the child's teacher to complete. The parents' questionnaires are expected to take 1.5 hours to complete, and the teacher's questionnaires are expected to take half an hour to complete. The children's tasks are expected to take 3.5 hours to complete. You will be asked to sign a form giving the teacher permission to fill out the questionnaires regarding your child. You will need to give this form, along with the teacher's questionnaires to their teacher, and the teacher will be asked to mail these completed questionnaires back to the researchers. Your questionnaires will need to be completed and also returned in the self addressed envelope. If your child is on medication for ADHD, you will be asked not to give them their medication on the morning that you bring him/her in to the university. This is standard practice in research with children who have ADHD as the medication effects their performance on some of the tasks. The researchers will be more then happy to discuss this procedure with you if you have any questions or concerns. Your child will be asked to stay at the university for about 3.5 hours in order to complete a number of tests. Some of these will be like the

things he/she does at school, others will test his/her memory, others will test creativity, and yet others will test how long he/she can attend to things. There will be a break between each test and refreshments will be offered. You are welcome to either stay and watch the testing of your child, or to leave and return to collect him/her at the end. Your child will be **paid $10** for their participation.

The results of the tests described above will be used for research purposes only in the context of this study. We are very careful in dealing with confidential information. You can feel assured that all information you disclose concerning yourself and your family will be kept in a confidential file which will be locked at all times. All information will be kept as group data. Therefore, forms will be coded and names removed so that you cannot be identified. Confidentiality will be respected and no information that discloses the identity of the participants will be released or published.

Participation in this study is voluntary. If you choose at any time during the process that you would no longer like to participate in this study you are entitled to withdraw all information and terminate your participation.

This study has been approved by the Human Ethics committee at the University of Canterbury, and will be conducted by **Dione Matthesius**, a Ph.D. student studying in the Psychology Department of the University of Canterbury.

Her work will be closely monitored by her two supervisors, **Dr. Julia Rucklidge** and **Dr. Thomas Keenan.** Dr Rucklidge is a member of the academic staff in the Psychology Department of the University of Canterbury whose specific research area is ADHD, and she is also a registered psychologist. Dr. Keenan is a member of the academic staff in the Psychology department of the University of Canterbury whose specific research area is child development.

You are encouraged to contact either of the above members of this research team with any questions you may have pertaining to this study. We are happy to discuss any aspect of the study, including further details about the procedures or tests involved. No commitment to taking part in the research will be implied by calling for further information.

Dione Matthesius (Principal Investigator):
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Home phone: **3439823**

Dr. Julia Rucklidge (supervisor):
Office phone: 3642987 ext. 7959

Dr. Thomas Keenan (supervisor):
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Attention Deficit Hyperactivity Disorder and Creativity: What is the link?

Teacher's Information Sheet

You are invited to take part in the current study on the similarities and differences between children diagnosed with ADHD (Attention Deficit Hyperactivity Disorder) and those identified as being highly creative.

Current research shows that there is a subgroup of highly creative children who have the same sorts of behaviours as children who have ADHD. They are seen to be inattentive, impulsive, and hyperactive. As ADHD is usually diagnosed on the basis of the child's behavioural characteristics, it can be very difficult to distinguish between ADHD and creativity in these cases. Yet, an incorrect diagnosis can have a very significant negative impact on the child's future development. Children with ADHD often need to be medicated and thrive best in a structured learning environment; while highly creative children do best in vastly stimulating, ever changing environments and have no need for medication.

The aim of this study is to try and look closely at these two groups of children and to find out what factors make the two phenomena different, so that future misdiagnosis of these children can be avoided.

In this study we will be working with three groups of children, those diagnosed with ADHD, those identified as being highly creative, and a comparison group of children who have neither been diagnosed with ADHD nor identified as highly creative. All of the parents, teachers and children that take part in the study will be required to follow the same procedure so that we can accurately compare the two groups to find out exactly where these children differ. This will help us to clearly distinguish between the two phenomena and avoid future misdiagnosis.

Your part in the research will involve filling the two questionnaires that have been given to you in this package. You will need to put the completed questionnaires into the self-addressed envelope provided, and send it back to the researchers.

The results of the tests described above will be used for research purposes only in the context of this study. We are very careful in dealing with confidential information. You can feel assured that all information you disclose will be kept in a confidential file which will be locked at all times. All information will be kept as group data. Therefore, forms will be coded and names removed such that no-one can be identified. Confidentiality will be respected and no information that discloses the identity of the participant will be released or published.

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Attention Deficit Hyperactivity Disorder and Creativity: What is the link?
Parent's Consent Form

I/we acknowledge that the research procedures described above have been explained to me and that any questions that I/we have asked have been answered to my/our satisfaction.

I/we understand that we are free to withdraw, with our child, from the study at any point, without any prejudice to present or future treatment. This would include withdrawal of information I/we have provided, should we wish to do so.

I/we know that any questions about the research may be asked now or in the future.

I/we have been assured that records relating to me/ us and my/our child will be kept confidential and that no information will be released or printed that would disclose personal identity.

I/we consent to our name being placed in a separate database so that we can be contacted in the future, should there be other studies for us to participate in, with the understanding that we can choose whether to participate in such studies or not:

YES NO

I hereby give consent for my child _____ to participate in this study.

_____	_____
Name of Parent	Name of person who obtained consent
_____	_____
Signature	Signature
_____	_____
Date	Date

Department of Psychology

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Attention Deficit Hyperactivity Disorder and Creativity: What is the link?

Parent's Teacher - Consent Form

I _____ of _____
Name of parent Address

Hereby consent to the disclosure or transmittal to or the examination by **Dione Matthesius, Julia Rucklidge, and Thomas Keenan**, of the two questionnaires: the **Child Behaviour Checklist** and the **Connors' Teacher Rating Scales**, at

_____
Name of school

in respect of _____, _____.
Child's name Date of birth

_____
Signature of parent

_____
Name of Witness

_____
Signature of Witness

Date the _____ day of _____ 200_____

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Attention Deficit Hyperactivity Disorder and Creativity: What is the link?
Child's Assent Form

Why are we doing this study? Concentration problems are known to affect people in many different ways. This study is going to look at how concentration problems may effect the way you feel about yourself, how you make sense of things that happen to you, and how fast you react to things going on around you. We want to find out more about how these problems may effect your life so that we can better help you and other children with these same problems.

What will happen during the study? You will be asked to answer some questions about yourself and to do some things that will test your memory, see how fast you complete tasks, and also some things that are kind of like what you do at school.

Are there good things and bad things about the study? There are no bad things from participating in this study. You will benefit by receiving study results. You will also be helping us better understand the problems that come from having a concentration problem.

Who will know about what I did in the study? No-one, other than your parents, is going to know what you did or how you did in the study. We keep this information safe.

Can I decide if I want to be in the study? If you do not want to be part of this study that is O.K. No-one will be upset or disappointed. If you say yes now but change your mind, you can say no later and that will be O.K. Please ask any questions if you do not understand what you have read or heard. We will help you understand. If you do want to be in the study no-one will know what answers you give and no-one will know how well you do.

I was present when _____ read this form and gave his/her verbal assent.

_____
Name of person who obtained assent

_____ _____
Signature Date

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Attention Deficit Hyperactivity Disorder and Creativity: What is the link?
Child's Assent Form

Why are we doing this study? Concentration problems are known to affect people in many different ways. This study is going to look at how these problems may effect the way you feel about yourself, how you make sense of things that happen to you, and how fast you react to things going on around you. We want to find out more about how these problems affect people's lives so that we can better help them. You have been chosen to take part in this study because you are going to act as a comparison to children who have been identified as having concentration problems.

What will happen during the study? You will be asked to answer some questions about yourself and to do some things that will test your memory, see how fast you complete tasks, and also some things that are kind of like what you do at school.

Are there good things and bad things about the study? There are no bad things from participating in this study. You will benefit by receiving study results. You will also be helping us better understand the problems that come from having a concentration problem.

Who will know about what I did in the study? No-one, other than your parents, is going to know what you did or how you did in the study. We keep this information safe.

Can I decide if I want to be in the study? If you do not want to be part of this study that is O.K. No-one will be upset or disappointed. If you say yes now but change your mind, you can say no later and that will be O.K. Please ask any questions if you do not understand what you have read or heard. We will help you understand. If you do want to be in the study no-one will know what answers you give and no-one will know how well you do.

I was present when _____ read this form and gave his/her verbal assent.

_____
Name of person who obtained assent

_____ _____
Signature Date

APPENDIX 5

1. University of Canterbury Human Ethics Approval

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UNIVERSITY OF CANTERBURY

3 August 2001

Dione Matthesius
C/o Julia Rucklidge & Thomas Keenan
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Dione

The Human Ethics Committee advises that your research proposal **"Attention deficit hyperactivity disorder and creativity: what is the link?"** has been considered and approved.

Yours sincerely

James M Coxon
Interim Chair